Technical Data

Allen-Bradley

PowerFlex 700L

Catalog Number 20L

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Original Instructions

LISTEN. THINK. SOLVE.®

Product Overview

PowerFlex 700L Liquid-Cooled AC drives are responsive, high performance, regenerative industrial drives for installations requiring a compact footprint. The PowerFlex 700L drive offers two versions of control: either the PowerFlex 700 Vector Control or the PowerFlex 700S Phase II Control. This provides the PowerFlex 700L drive with exceptional and proven performance as well as the same interface, communications capabilities and programming tools of the air-cooled drives. The many features allow the user to easily configure the drive for most application needs. Ratings presently available include:

- 268...960 Hp (200...715 kW) at 400V AC
- 300...1150 Hp (224...860 kW) at 480V AC
- 465...870 Hp (345...650 kW) at 600V AC
- 475...881 Hp (355...657 kW) at 690V AC

Frame 2

Frame 3B
(shown with enclosure doors open)

Key Features/Benefits

Space Saving Features

The PowerFlex 700L AC drive features a patented liquid-cooled heatsink design to transfer over 80% of the drive heat loss to the liquid coolant, resulting in the best drive power-to-size ratio in the market. The integral active converter and line filter translate to a fully regenerative drive that's over 60% smaller than typical air-cooled drives.

Integrated Line Regenerative Braking For Precise Control and Energy Savings

- The Liquid-Cooled AC drive features regenerative braking which is ideal for precise, high-response speed and position control, continuous holdback, rapid deceleration and stopping of high inertia loads. Instead of wasting energy with resistor braking technology, regenerative braking actually puts the energy back into the system to be used by other equipment.
- Regenerative braking eliminates the need for large resistor banks. These resistors banks can create a lot of heat and must frequently be cleaned.

Improved Power Quality with Regenerative Rectifier

- Compact and cost-effective means to achieve compliance with CE and IEEE 519 harmonic limits.
- Actively controls power factor regardless of motor speed which reduces input line currents and minimizes the size of upstream devices.
- Input Voltage Boost
- Integrated active converter and line-side filter allow ‘input voltage boost’ to protect your system from power disturbances.
- Maintains consistent system performance in the event of power dips or other power quality issues.
- Provides full 480V AC to the motor even when operating on 380V AC power lines.

Flexible Control Platforms

- Designed for applications with requirements ranging from the simplest speed control to the most demanding torque control, the PowerFlex 700L drive is available with either PowerFlex 700 Vector Control or PowerFlex 700S Control.
- Outstanding open or closed loop speed regulation for applications ranging from fans and pumps to precise winder control.
- Excellent torque production and tight torque regulation for demanding applications like extruders, web process, and test stands.
- Fast update times of torque inputs are suitable for high performance applications.
- All of this flexibility is possible through multiple control modes: V/Hz control, Sensorless Vector, Vector Control with FORCE™ Technology, and Permanent Magnet Control (700S control only).
- Safe Off Option(1), the first offering available within the DriveGuard™ series of safety solutions, prevents a drive from delivering rotational energy to motors by integrating a safety circuit with the drive's power switching signals. This solution meets EN13849-1, Category 3.

Packaging Options

- The PowerFlex 700L frame 2 is an IP00 (Open Style) panel mount drive that can be mounted in a variety of enclosures.
- The PowerFlex 700L frame 3A and 3B are available in a IP20 (NEMA 1) Rittal enclosure that includes the input circuit breaker.
- The majority of heat lost from the drive is transferred to the liquid coolant. Therefore, other enclosure options such as IP54 (NEMA/UL Type 12) or IP66 (NEMA/UL Type 4X) can be used and placed directly into dusty, dirty, and outdoor environments. Contact your local Rockwell Automation drive center for these packaging options.

Cooling Loop Options

A liquid-to-liquid or liquid-to-air heat exchanger, or a chiller can be used with the PowerFlex 700L drive. See page 39 for more information.

(1) At time of publication, the Safe Off Option is available with the PowerFlex 700S Control Option in frame 3A and 3B PowerFlex 700L drives.

Communication and Human Interface Options

Premier Integration with PowerFlex Drives and RSLogix 5000 Software

For simplified AC drive start-up and reduced development time, we've integrated Allen-Bradley PowerFlex drive configuration with RSLogix™ 5000 software. This single-software approach simplifies parameter and tag programming while still allowing stand-alone drive software tool use on the factory floor.

Communication Modules

DPI communication modules provide fast and efficient control and/or data exchange over the following interfaces:

- DeviceNet™
- ControlNet™
- EtherNet/IP™
- Serial Communications
- Other open control and communication networks

Unsurpassed Capability in Network Communications

PowerFlex drives are fully compatible with the wide variety of Allen-Bradley DPI™ communication adapters, offering the following benefits.

DeviceNet	ControlNet	EtherNet/IP	RS485 DF1	PROFIBUS DP	CANopen	Modbus RTU	Modbus TCP	Metasys N2	Siemens P1 FLN	Description
x	x	x								**Unconnected Messaging** permits other network devices (for example, PanelView™) to communicate directly to a drive without routing the communication through the network scanner.
x	x	x	x			x				**Adapter Routing** – Plug PC into one drive and talk to all other Allen-Bradley drives on same network, without being routed through the network scanner.
x	x	x	x	x	x	x	x	x	x	Access to 100% of all parameters over the network.
x		x		x						**AutoBaud** capability makes initial connections less problematic.
x										**Change of State** significantly reduces network traffic by configuring control messages to be sent only upon customer defined states. Very flexible configuration for each node (Example: 'reference must change by more than 5%').
x		x								**Peer Control** provides master-slave type control between drives, where one or more slave drives (consumers) can run based on the status of a master drive (producer), which can also significantly reduce network traffic.
x										**Automatic Device Replacement (ADR)** saves significant time and effort when replacing a drive, by allowing the scanner to be configured to automatically detect a new drive and download the required parameter settings.
x	x	x	x	x	x	x	x	x	x	**Flexible Fault Configuration** – Adapters can be programmed to take fault based actions such as ramp to stop, coast-to-stop, and hold last state, as well as send user configurable logic control and speed reference values. In addition, different actions can be taken based on whether the network experienced a serious problem (broken cable, and so forth) versus a network idle condition (PLC set to 'Program').

PowerFlex Architecture-Class LCD Human Interface Modules

- An LCD Human Interface Module (also used with the PowerFlex 70, PowerFlex 700, PowerFlex 700S, and PowerFlex 700H) provides multilingual text for startup, metering, programming, and troubleshooting.
- Large and easy to read 7 line x 21 character backlit display
- Alternate function keys for shortcuts to common tasks
- 'Calculator-like' number pad for fast and easy data entry (Full Numeric version only)
- Control keys for local start, stop, speed, and direction
- Remote versions for panel mount applications

PC-based Configuration Tools

- Connected Components Workbench™ software. A free, simple, and flexible 'on-line' tool for monitoring and configuring while connected to a drive.
- DriveTools™ SP. A suite of software tools which provide an intuitive means for programming, troubleshooting, and maintaining Allen-Bradley AC and DC drives.

Catalog Number Explanation

Position	1-3	4	5-7	8	9	10	11	12	13	14	15	16	17	18
	20L	E	800	A	0	E	N	N	A	N	1	0	W	A
	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*

a

Drive

Code	Type
20L	PowerFlex 700L

b

Voltage Rating

Code	Voltage	Ph.
C	400V AC	3
D	480V AC	3
E	600V AC	3
F	690V AC	3

c1

ND Rating

400V, 60 Hz Input

Code	Amps	Hp (KW)	Frame
360	360	268 (200)	2
650	650	500 (370)	3A
1K2	1250	960 (715)	3B

c2

ND Rating

480V, 60 Hz Input

Code	Amps	Hp (KW)	Frame
360	360	300 (224)	2
650	650	600 (445)	3A
1K2	1250	1150 (860)	3B

c3

ND Rating

600V, 60 Hz Input

Code	Amps	Hp (KW)	Frame
425	425	465 (345)	3A
800	800	870 (650)	3B
1K1	1175	1275 (950)	3B ♣

♣ Must operate at 2 kHZ PWM only, and only as a stand-alone inverter module ("K" in position 13).

c4

ND Rating

690V, 60 Hz Input

Code	Amps	Hp (KW)	Frame
380	380	475 (355)	3A
705	705	881 (657)	3B
1K0	1050	1310 (980)	3B ♣

♣ Must operate at 2 kHZ PWM only, and only as a stand-alone inverter module ("K" in position 13).

d

Enclosure

Code	Type	Conformal Coating
A	NEMA/UL Type 1, IP20 †	No
N	Open-Chassis Style/IP00 ❖	No

† Frame 3 complete drive.

❖ Frame 2 drive and frame 3 input filter and power modules.

e

HIM

Code	Operator Interface
0	No HIM/Blank Cover
3	Full Numeric LCD ♠
C	Door-Mounted Full Numeric LCD †

♠ Frame 2 and frame 3 power modules.

† Frame 3 complete drive only.

f

Documentation

Code	Documents	Ship Carton
E	English Doc Set	Yes
N	No Documentation	Yes
Q	No Documentation	No

g

Brake

Code	w/Brake IGBT
N	No

h

Brake Resistor

Code	w/Resistor
N	No

i

Equipment Type

Code	Description	Frame
A	Complete Regenerative Drive - Std. Interrupt Rating	2, 3A, and 3B
C	Input Filter	3A and 3B
E	Combined Active Converter/ Inverter Power Module	3A only
G	Active Converter Power Module	3B only
J	Inverter Power Module - Coupled Version	3B only
K	Inverter Power Module - Common DC Bus Version	3B only
L	Dual Inverter Power Module	3A only
P	Active Converter Power Module - Stand Alone Version	3B only
X	Spare Power Module ◆	3A and 3B

◆ No control cassettes.

j

Comm Slot

Code	Communication Option	DPI User-Installed Kit Cat. No. ✧
N	None	N
C	ControlNet (Coax) - DPI ‡	20-COMM-C
D	DeviceNet - DPI ‡	20-COMM-D
E	EtherNet/IP - DPI ‡	20-COMM-E
1	DriveLogix Comm Option, ControlNet (Coax) ✻	—
2	DriveLogix Comm Option, ControlNet Redundant (Coax) ✻	—
3	DriveLogix Comm Option, ControlNet (Fiber) ✻	—
4	DriveLogix Comm Option, ControlNet Redundant (Fiber) ✻	—
5	DriveLogix Comm Option, DeviceNet (Open Connection) ✻	—
6	DriveLogix Comm Option, DeviceNet (Twisted Pair) ✻	—

✧ For 700S Phase II Control with DriveLogix5730, comm. slot option selections are mutually exclusive. For two communication adapters, (DPI and DriveLogix), select the DriveLogix comm. slot option and order the DPI user installed kit catalog number separately.

‡ 700 Vector Control uses DPI comm. slot options only.

✻ DriveLogix comm. slot options require 700S Phase II Control with DriveLogix5730.

Position

1-3	*4*	*5-7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
20L	**E**	**800**	**A**	**0**	**E**	**N**	**N**	**A**	**N**	**1**	**0**	**W**	**A**
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*

k

Control Option

Code	Control	Cassette	Logic Expansion	Synch Link
1	700VC 24V I/O	Base	N/A	N/A
2	700VC 115V I/O	Base	N/A	N/A
A	700S Ph. II	Expanded	No	No
B	700S Ph. II	Expanded	No	Yes
C	700S Ph. II	Expanded	Yes	No ▲
D	700S Ph. II	Expanded	Yes	Yes ▲
W	None ❖	N/A	N/A	N/A

❖ Frame 3 input filter, Active Converter Power Modules, and spare power modules.

▲ Requires DriveLogix5730.

l

Feedback

Code	Control Option	Type
0	All	None
1	700VC	Encoder 5V/12V
A	700S Ph. II	Resolver ❤
B	700S Ph. II	Hi-Res. Stegmann Encoder ❤
C	700S Ph. II	Multi-Device Interface ❤ ✠
E	700S Ph. II	2nd Encoder ❤
S	700S Ph. II	Safe-Off (w/2nd Encoder) ❤

❤ Requires expanded cassette.

✠ Multi-Device Interface allows the connection of the Stegmann and Temposonics linear sensors. The Temposonics sensor **cannot** be used to close motor control or speed loops.

m

Additional 700S Configuration

Code	Logix Option	Embedded Comm.
W	None	—
E	Phase II Control	No
K	Phase II Control with DriveLogix5730	No
L	Phase II Control with DriveLogix5730	EtherNet/IP

n

Coolant Type

Code	Coolant	Frame
N	None	3 Input Filter only
A	Water	All

Standard Drive Product Selection

400V AC Three-phase Drives

Output Amps (with 400V AC Induction Motor) (1)						Nominal Power Ratings				IP20, NEMA/UL Type 1 (2)	Frame Size	PWM Freq. (kHz)
Normal Duty			Heavy Duty			Normal Duty		Heavy Duty		Cat. No.		
Cont.	110% 1 min	150% 3 s	Cont.	150% 1 min	200% 3 s	kW	Hp	kW	Hp			
360	396	540	264	396	540	200	268	150	200	20LC360N0ENNAN10WA	2	4
650	715	975	475	715	975	370	500	270	365	20LC650A0ENNAN10WA	3A	4
1250	1375	1875	915	1375	1875	715	960	525	700	20LC1K2A0ENNAN10WA	3B	4

(1) Frame 2 ratings are based on 50 °C ambient and 50 °C coolant. Frame 3A and 3B ratings are based on 40 °C ambient and 40 °C coolant.

(2) Frames 3A and 3B only. Frame 2 drives are IP00, NEMA/UL Type Open.

480V AC Three-phase Drives

Output Amps (with 480V AC Induction Motor) (1)						Nominal Power Ratings				IP20, NEMA/UL Type 1 (2)	Frame Size	PWM Freq. (kHz)
Normal Duty			Heavy Duty			Normal Duty		Heavy Duty		Cat. No.		
Cont.	110% 1 min	150% 3 s	Cont.	150% 1 min	200% 3 s	kW	Hp	kW	Hp			
360	396	540	264	396	540	224	300	175	235	20LD360N0ENNAN10WA	2	4
650	715	975	475	715	975	445	600	325	440	20LD650A0ENNAN10WA	3A	4
1250	1375	1875	915	1375	1875	860	1150	630	845	20LD1K2A0ENNAN10WA	3B	4

(1) Frame 2 ratings are based on 50 °C ambient and 50 °C coolant. Frame 3A and 3B ratings are based on 40 °C ambient and 40 °C coolant.

(2) Frames 3A and 3B only. Frame 2 drives are IP00, NEMA/UL Type Open.

600V AC Three-phase Drives

Output Amps (with 600V AC Induction Motor) (1)						Nominal Power Ratings				IP20, NEMA/UL Type 1	Frame Size	PWM Freq. (kHz)
Normal Duty			Heavy Duty			Normal Duty		Heavy Duty		Cat. No.		
Cont.	110% 1 min	150% 3 s	Cont.	150% 1 min	200% 3 s	kW	Hp	kW	Hp			
425	470	640	315	470	640	345	465	255	345	20LE425A0ENNAN10WA	3A	4
800	885	1200	590	885	1200	650	870	480	640	20LE800A0ENNAN10WA	3B	4
1175	1295	1765	860	1295	1765	955	1275	695	935	20LE1K1A0ENNAN10WA	3B	2 (2)

(1) Frame 3A and 3B ratings are based on 40 °C ambient and 40 °C coolant.

(2) Must operate at 2 kHz PWM only, and only as a stand-alone inverter module ('K' in catalog string position 13).

690V AC Three-phase Drives

Output Amps (with 690V AC Induction Motor) (1)						Nominal Power Ratings				IP20, NEMA/UL Type 1	Frame Size	PWM Freq. (kHz)
Normal Duty			Heavy Duty			Normal Duty		Heavy Duty		Cat. No.		
Cont.	110% 1 min	150% 3 s	Cont.	150% 1 min	200% 3 s	kW	Hp	kW	Hp			
380	420	570	280	420	570	355	475	260	350	20LF380A0ENNAN10WA	3A	4
705	780	1060	520	780	1060	657	881	485	650	20LF705A0ENNAN10WA	3B	4
1050	1155	1575	770	1155	1575	980	1315	720	965	20LF1K0A0ENNAN10WA		2 (2)

(1) Frame 3A and 3B ratings are based on 40 °C ambient and 40 °C coolant.

(2) Must operate at 2 kHz PWM only, and only as a stand-alone inverter module ('K' in catalog string position 13).

Factory Installed Options

Human Interface and Wireless Interface Modules IP20, NEMA/UL Type 1 *(Position e)*

Cat. Code: 0
No HIM (Blank Plate)

Cat. Code: 3
LCD Display, Full Numeric Keypad

Cat. Code: C
Door Mounted Bezel LCD Display, Full Numeric Keypad NEMA/UL Type 1

Documentation

Description	Cat. Code *(Position f)*
English Documentation Set	E
No Documentation	N

Internal Communication Adapters

Description	Cat. Code *(Position j)*
None	N
ControlNet™ Communication Adapter (Coax) ‡	C
DeviceNet™ Communication Adapter ‡	D
EtherNet/IP™ Communication Adapter ‡	E
DriveLogix Comm Option, ControlNet (Coax) §	1
DriveLogix Comm Option, ControlNet Redundant (Coax) §	2
DriveLogix Comm Option, ControlNet (Fiber) §	3
DriveLogix Comm Option, ControlNet Redundant (Fiber) §	4
DriveLogix Comm Option, DeviceNet (Open Conn.) §	5
DriveLogix Comm Option, EtherNet/IP (Twisted Pair) §	6

‡ 700 Vector Control uses DPI comm. slot options only.
§ DriveLogix comm. slot option requires 700S Phase II Control with DriveLogix5730.

Control Options

Control Option	Description	Cat. Code *(Position k)*
700VC - 24V I/O	Base Cassette	1
700VC - 115V I/O	Base Cassette	2
Phase II Control	Expanded Cassette Only	A
	Expanded Cassette w/SynchLink	B
Phase II Control ∗	Expanded Cassette w/Logix Expansion Board	C
	Expanded Cassette w/Logix Expansion Board & SynchLink	D

∗ Requires DriveLogix5730.

Feedback Options

Control Type	Description	Cat. Code *(Position l)*
All	No Encoder	0
700VC	12V/5V Encoder	1
700S Phase II	Resolver, 10…26V, 10 kHz, 10…16 bit	A
	Stegmann - High Resolution Encoder Hyperface, 8.5V dc, 20 bit, 100k/r §	B
	Multi-Device Interface - for Stegmann or Linear Temposonics §	C
	2nd Encoder, 5V or 12V Configurable by the Drive §	E
	DriveGuard Safe-Off (w/2nd Encoder) §	S

§ Requires Expanded Cassette.

Additional 700S Configurations

Description	Embedded Communication	Cat. Code *(Position m)*
None	—	W
Phase II Control	No	E
Phase II Control, with DriveLogix5730 Controller	No	K
Phase II Control, with DriveLogix5730 Controller & EtherNet/IP	EtherNet/IP	L

Coolant Options

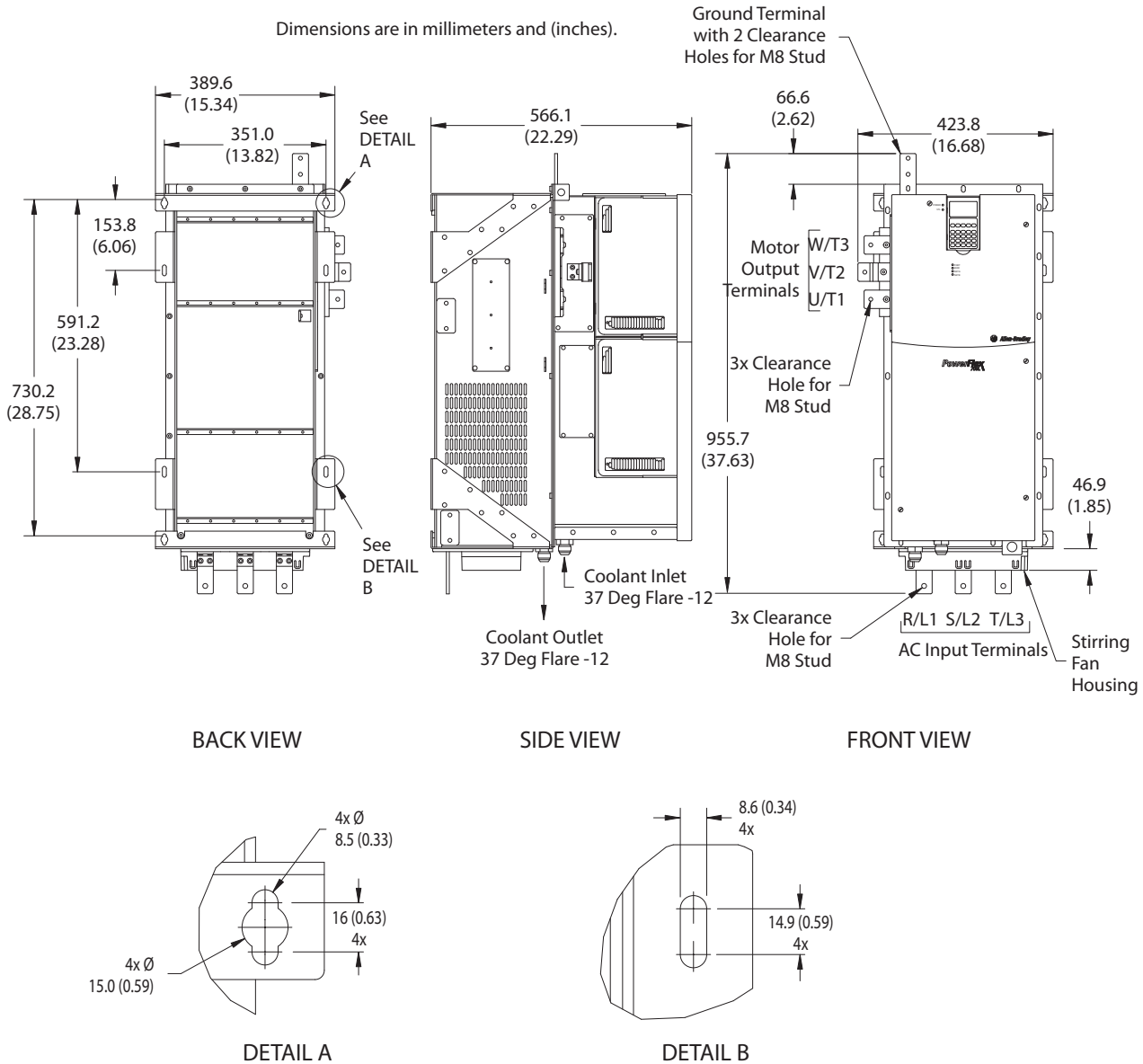
Description	Frame	Cat. Code *(Position n)*
Water	All	A

User Installed Options

For information on user installed options, see the PowerFlex Low Voltage AC Drives Selection Guide, publication PFLEX-SG002.

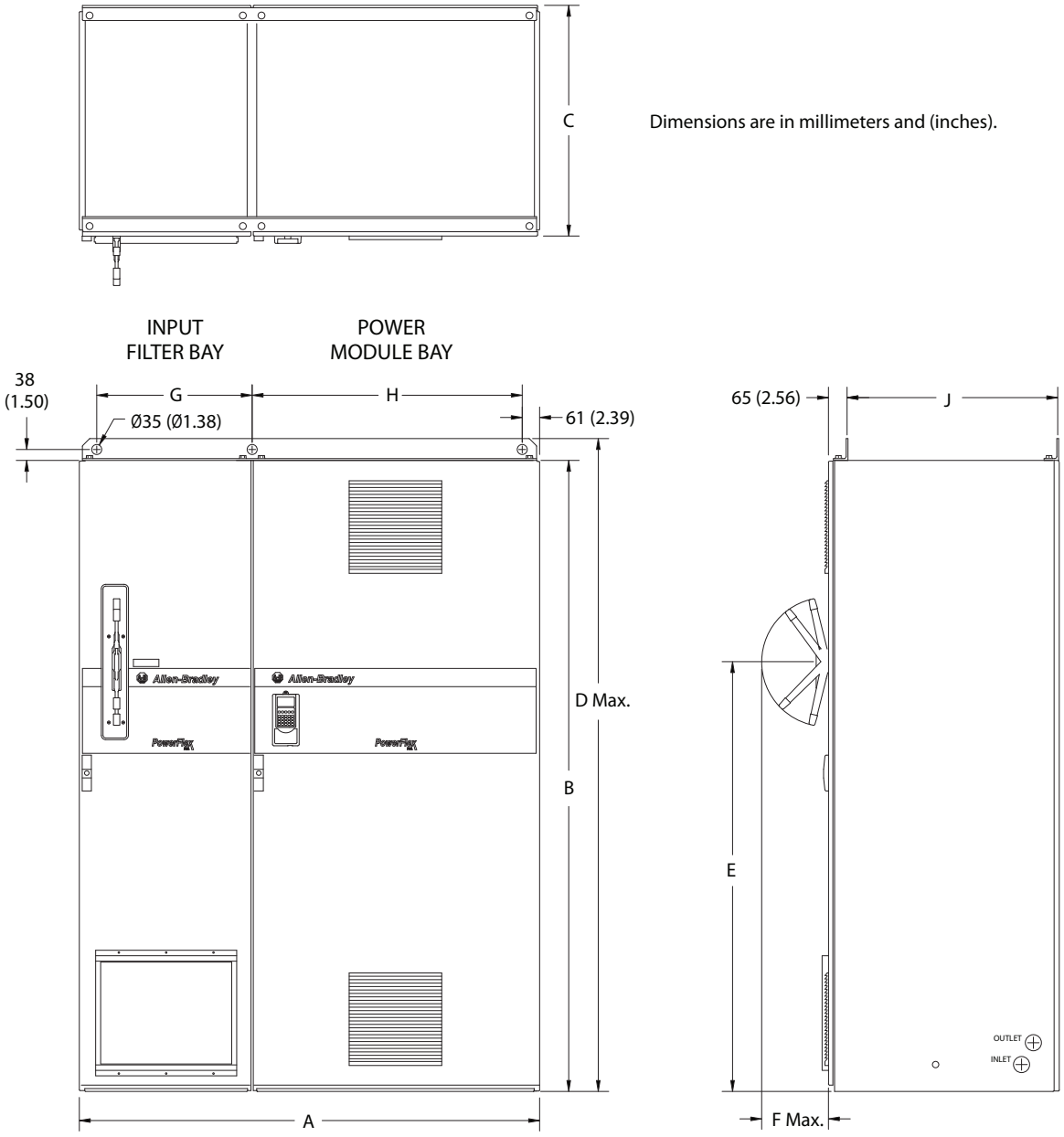
Product Dimensions

Frame 2 Drive



Weight: 186 kg (410 lb)

Frame 3A/3B Drive



Dimensions are in millimeters and (inches).

Frame Size	Dimensions									Weight kg (lb)
	A	B	C	D	E	F	G	H	J	Complete Drive
3A	1200 (47.2)	2000 (78.7)	600 (23.6)	2078 (81.9)	1500 (59.1)	233 (9.2)	542 (21.3)	542 (21.3)	535 (21.1)	950 (2090)
3B	1600 (63.0)	2200 (86.6)	800 (31.5)	2278 (89.8)	1500 (59.1)	233 (9.2)	542 (21.3)	942 (37.1)	735 (28.9)	1361 (3000)

Installation Considerations

Power Wiring

The PowerFlex 700L has the following built-in protective features to help simplify installation:

- Ground fault protection during start up and running ensures reliable operation
- Electronic motor overload protection increases motor life

AC Supply Source Considerations

PowerFlex 700L Liquid-Cooled AC drives are suitable for use on a circuit capable of delivering up to a maximum of 200,000 rms symmetrical amperes.

PowerFlex 700L Liquid Cooled AC drives should not be used on undersized or high-impedance supply systems. The supply system kVA should be equal to or greater than the drive-rated kW, and the system impedance should be less than 10%. Operation outside these limits could cause instability resulting in drive shutdown.

PowerFlex 700L Liquid Cooled AC drives have a built-in LCL filter which includes a 3% input line reactor. Additional input line reactors are not recommended.

Unbalanced, Ungrounded or Resistive Grounded Distribution Systems

Removable MOV to ground and common mode capacitors to ground ensure compatibility with ungrounded systems. These devices must be disconnected if the drive is installed on a resistive grounded distribution system, an ungrounded distribution system, or a B phase grounded distribution system. These devices must also be disconnected if a regenerative unit is used as a bus supply or brake.

Input Power Conditioning

Certain events on the power system supplying a drive can cause component damage or shortened product life. These events include the following:

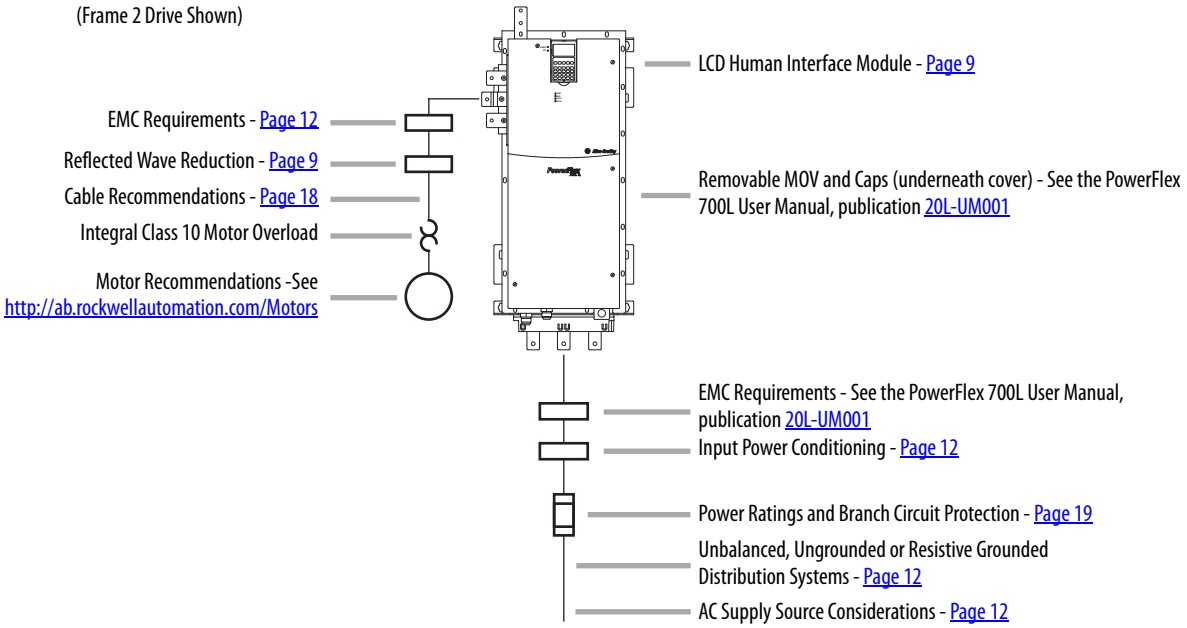
- The power system has power factor correction capacitors switched in and out of the system, either by the user or by the power company.
- The power source has intermittent voltage spikes in excess of 6000 volts. These spikes could be caused by other equipment on the line or by events such as lightning strikes.
- The power source has frequent interruptions.

There are many other factors that must be considered for optimal performance in any given application. Primary Installation Considerations on page 13 highlights the primary installation considerations. For detailed recommendations on input power conditioning, reflected wave protection, and motor cable types, see the Wiring and Grounding Guidelines for PWM AC Drives, Installation Instructions, publication DRIVES-IN001.

EMC Requirements

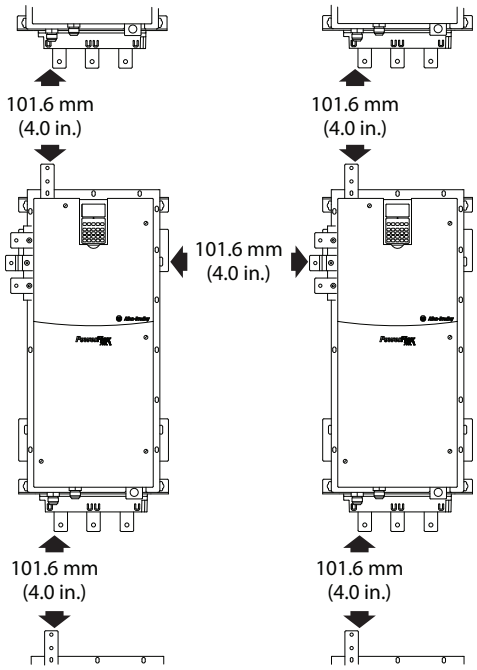
The 700VC control option for frame 2 comes with two common mode chokes—one for input and one for output. The 700S control option for frame 2 requires a field-installed kit SK-L1-CHK2-F2. See the PowerFlex 700L User Manual, publication 20L-UM001, for other CE requirements. PowerFlex 700L frame 3A and 3B drives do not require common mode chokes for CE compliance.

Primary Installation Considerations


(Frame 2 Drive Shown)
EMC Requirements - Page 12
Reflected Wave Reduction - Page 9
Cable Recommendations - Page 18
Integral Class 10 Motor Overload
Motor Recommendations -See http://ab.rockwellautomation.com/Motors
LCD Human Interface Module - Page 9
Removable MOV and Caps (underneath cover) - See the PowerFlex 700L User Manual, publication 20L-UM001
EMC Requirements - See the PowerFlex 700L User Manual, publication 20L-UM001
Input Power Conditioning - Page 12
Power Ratings and Branch Circuit Protection - Page 19
Unbalanced, Ungrounded or Resistive Grounded Distribution Systems - Page 12
AC Supply Source Considerations - Page 12

Frame 2 Drive

Recommended Mounting Clearances



Specified vertical clearance requirements are intended to be from drive to drive. Other objects can occupy this space; however, reduced air flow may cause protection circuits to fault the drive. In addition, inlet air temperature must not exceed the product specification.

Mounting Requirements

The PowerFlex700L frame 2 drive is a single integrated assembly consisting of a filter section and a power section. The filter section provides the mounting feet and represents greater than 50% of the approximately 186 kg (410 lb) total weight. Follow these mounting requirement guidelines:

- Mount the frame 2 drive into an enclosure that is designed according to Electrical Equipment Pollution Degree 2 requirements.
- Size and fasten any enclosure mounting panel appropriately to accommodate for the weight of the drive.
- See the PowerFlex 700L User Manual, publication 20L-UM001, for detailed mounting instructions.

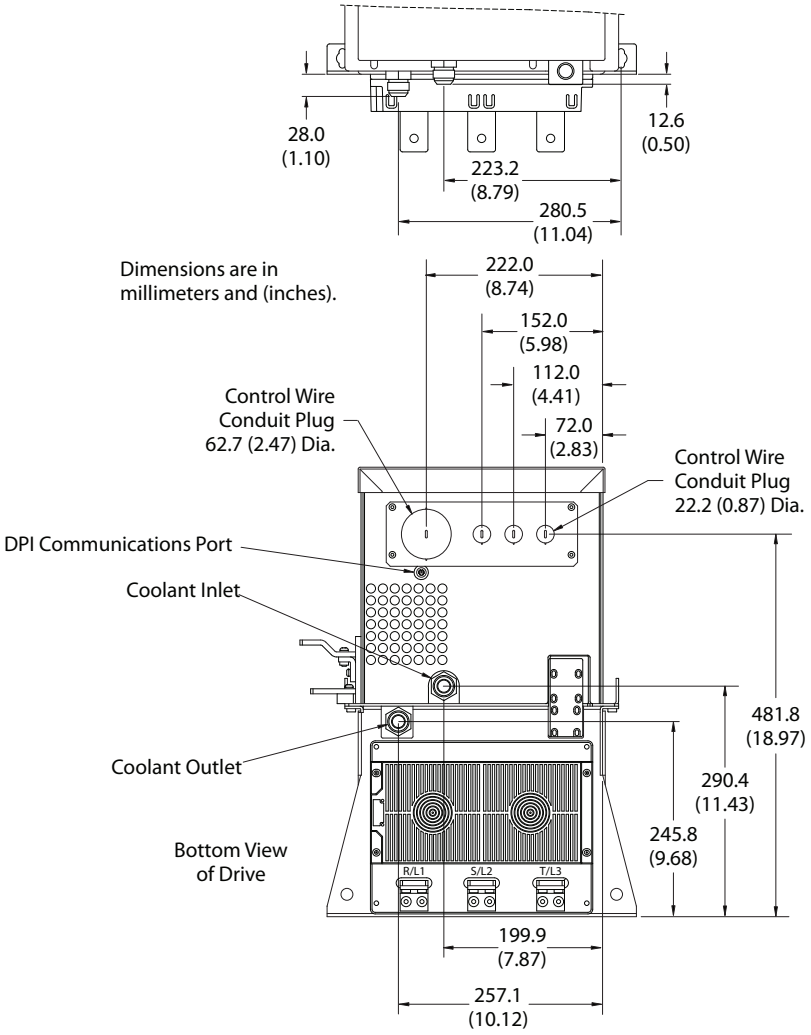
Determining Wire Routing for Control, Ground, Drive Input, and Motor Output

All wiring should be installed in conformance with the applicable local, national, and international codes (for example, NEC/CEC). Signal wiring, control wiring, and power wiring must be routed in separate conduits to prevent interference with drive operation. When hubs are not provided, use grommets to guard against wire chafing.

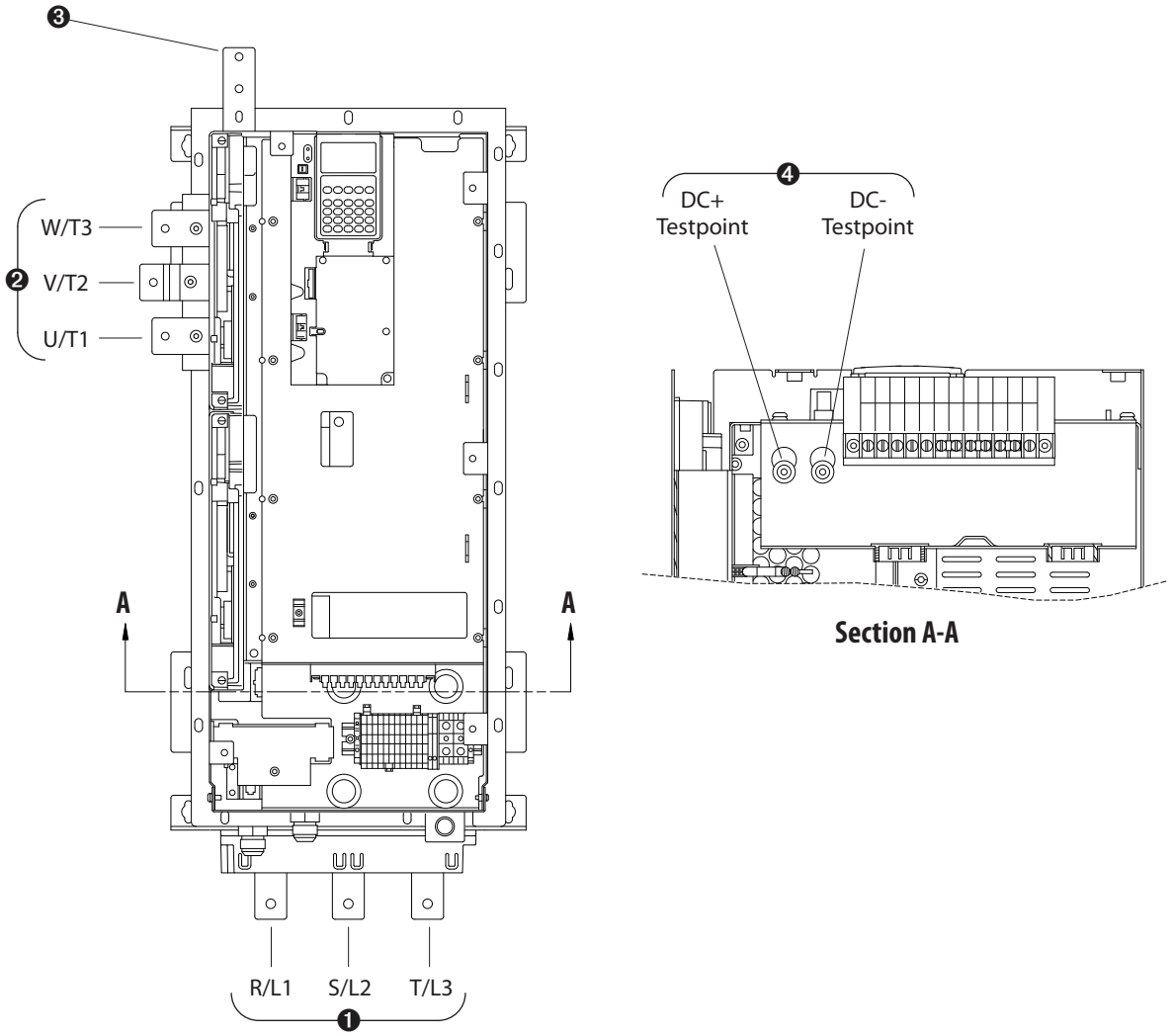
Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe this precaution can result in damage to, or destruction of, the equipment.

Do not route more than three sets of motor leads through a single conduit. This minimizes cross-talk that can reduce the effectiveness of noise reduction methods. If more than three drive/motor connections per conduit are required, shielded cable must be used. If possible, each conduit should contain only one set of motor leads.

Frame 2 Locations for Control Wire Routing, DPI Communication Port, and Coolant Connections



Frame 2 Power Terminal Locations



Frame 2 Power Terminal Specifications

Item	Name	Description	Recommended Tightening Torque (±10%)	Terminal Bolt Size [3]
❶	Input Power Bus Bar [1] R/L1, S/L2, T/L3	Input power	40 N•m (354 lb•in)	M8
❷	Output Power Bus Bar [1] U/T1, V/T2, W/T3	Motor connections	40 N•m (354 lb•in)	M8
❸	PE, Motor Ground Bus Bar [1]	Terminating point for wiring shields and grounds	40 N•m (354 lb•in)	M8
❹	DC Bus Test Point Socket [2] (2 Terminals; DC+, DC-)	4 mm socket for DC bus voltage measurement only	—	—

(1) These connections are bus bar type terminations and require the use of lug connectors.

(2) Use only to verify that DC bus capacitors are discharged before servicing the power module. No other external use is permitted.

(3) Apply counter torque to the nut on the other side of terminations when tightening or loosening the terminal bolt to avoid damage to the terminal.

Frame 3A/3B Drive

Recommended Mounting Clearances

Verify that there is adequate clearance for air circulation around the drive enclosures. A 15 cm (6 in.) minimum clearance is required wherever vents in the cabinet are located.

Determining Wire Routing for Control, Ground, Drive Input, and Motor Output

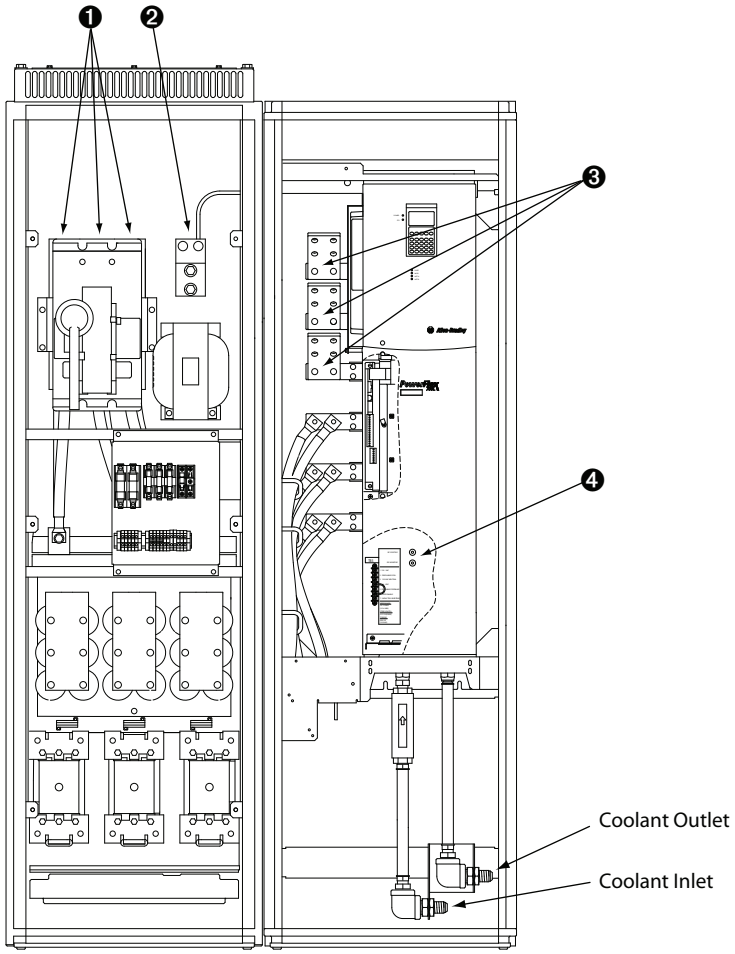
All wiring should be installed in conformance with the applicable local, national, and international codes (for example, NEC/CEC). Signal wiring, control wiring, and power wiring must be routed in separate conduits to prevent interference with drive operation. When hubs are not provided, use grommets to guard against wire chafing.

Do not route signal and control wiring with power wiring in the same conduit. This can cause interference with drive operation. Failure to observe this precaution can result in damage to, or destruction of, the equipment.

Do not route more than three sets of motor leads through a single conduit. This minimizes cross-talk that can reduce the effectiveness of noise reduction methods. If more than three drive/motor connections per conduit are required, shielded cable must be used. If possible, each conduit should contain only one set of motor leads.

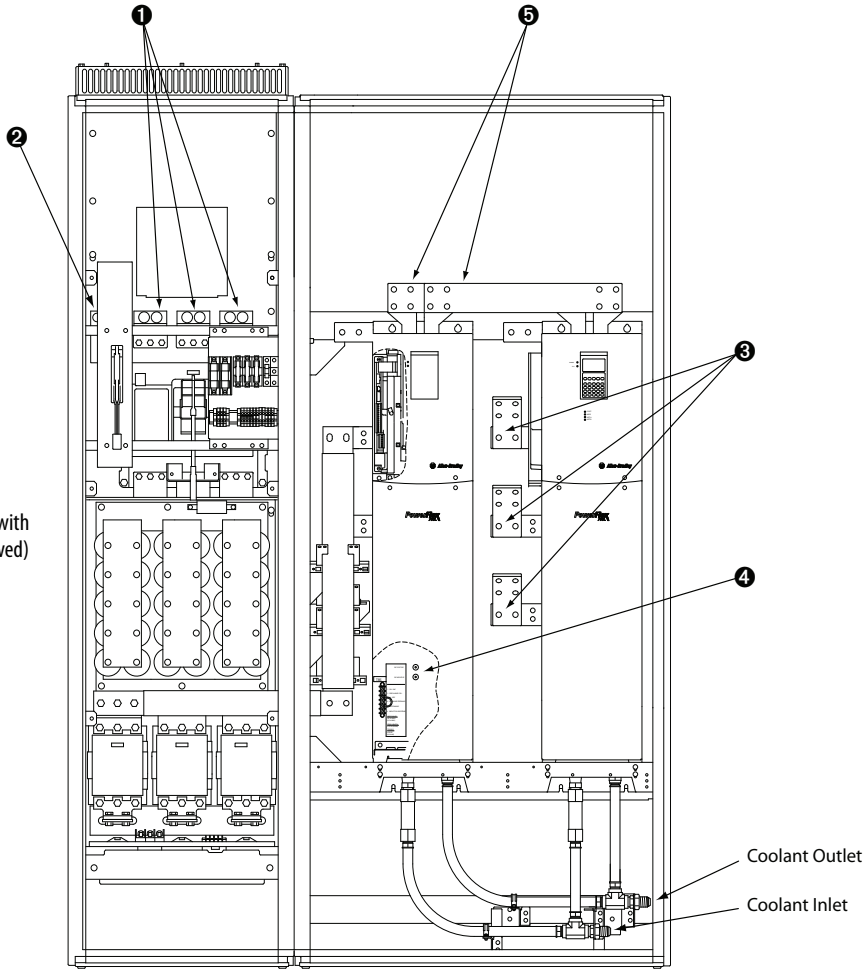
Frame 3A Power Terminal Locations

(Drive shown with doors removed)



Frame 3B Power Terminal Locations

(Drive shown with doors removed)



Frame 3A/3B Power Terminal Specifications

Item	Name	Description	Frame Size	Wire Size Range (4)		Recommended Tightening Torque (±10%)
				Maximum	Minimum	
❶	Input Power Wire Lugs R/L1, S/L2, T/L3	Input power connections on drive	3A	400 MCM	3/0	42 N•m (375 lb•in)
			3B	1000 MCM	500 MCM	62 N•m (550 lb•in)
❷	PE Wire Lug	Terminating point for ground wires	3A or 3B	600 MCM	# 2 AWG	34 N•m (300 lb•in)
❸	Output Power Bus Bar (1) U/T1, V/T2, W/T3	Motor connections	3A or 3B			62 N•m (550 lb•in)
❹	DC Bus Test Point Socket (2) (2 Terminals; DC+, DC-)	4 mm socket for DC bus voltage measurement only	3A or 3B	—	—	—
❺	DC Power Bus Bar (1) (3) (2 Terminals; DC+, DC-)	DC power from Converter Power Module to Inverter Power Module	3B			62 N•m (550 lb•in)

(1) These connections are bus bar type terminations and require the use of lug connectors.
(2) Use only to verify that DC bus capacitors are discharged before servicing the power module. No other external use is permitted.
(3) Size DC power conductors for current carrying capacity as follows: 400/480V, 1000 Amps; 600/690V, 800 Amps.
(4) Maximum/minimum sizes that the terminals will accept - these are not recommendations.

Cable Recommendations

Cable Types Acceptable for 200-600 Volt Installations

A variety of cable types are acceptable for drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 0.3 meters (1 foot) for every 10 meters (32.8 feet) of length. In all cases, long parallel runs must be avoided. Do not use cable with an insulation thickness less than or equal to 15 mils (0.4mm/0.015 in.). **Use Copper wire only**. Wire gauge requirements and recommendations are based on 75 °C (167 °F). Do not reduce wire gauge when using higher temperature wire. See the table on page 19.

Unshielded Cable

THHN, THWN, or similar wire is acceptable for drive installation in dry environments provided adequate free air space and/or conduit fill rate limits are used. **Do not use THHN or similarly coated wire in wet areas**. Any wire chosen must have a minimum insulation thickness of 15 mils (0.4mm/0.015 in.) and should not have large variations in insulation concentricity.

Shielded Cable

Shielded cable contains all of the general benefits of multi-conductor cable with the added benefit of a copper braided shield that can contain much of the noise generated by a typical AC drive. Strong consideration for shielded cable should be given in installations with sensitive equipment such as weigh scales, capacitive proximity switches, and other devices that may be affected by electrical noise in the distribution system. Applications with large numbers of drives in a similar location, imposed EMC regulations, or a high degree of communication/networking are also good candidates for shielded cable.

Shielded cable may also help reduce shaft voltage and induced bearing currents for some applications. In addition, the increased impedance of shielded cable may help extend the distance that the motor can be located from the drive without the addition of motor protective devices such as terminator networks. See 'Reflected Wave' in Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001.

Consideration should be given to all of the general specifications dictated by the environment of the installation, including temperature, flexibility, moisture characteristics, and chemical resistance. Additionally, a braided shield should be included and be specified by the cable manufacturer as having coverage of at least 75%. An additional foil shield can greatly improve noise containment.

A good example of recommended cable is Belden® 29528-29532 (AWG-1 through AWG-410). This cable has three XLPE insulated conductors plus ground with a spiral copper shield surrounded by a PVC jacket.

Other types of shielded cable are available, but the selection of these types may limit the allowable cable length. Particularly, some of the newer cables twist 4 conductors of THHN wire and wrap them tightly with a foil shield. This construction can greatly increase the cable charging current required, and reduce the overall drive performance. These cables are not recommended.

Armored Cable

Cable with continuous aluminum armor is often recommended in drive system applications or specific industries. It offers most of the advantages of standard shielded cable and also combines considerable mechanical strength and resistance to moisture. It can be installed in concealed and exposed manners and removes the requirement for conduit (EMT) in the installation. It can also be directly buried or embedded in concrete.

Because noise containment can be affected by incidental grounding of the armor to building steel when the cable is mounted, we recommend that the armor cable have an overall PVC jacket. For details, see 'Wire Types' in Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001.

Interlocked armor is acceptable for shorter cable runs, but continuous welded armor is preferred.

Best performance is achieved with three spaced ground conductors, but acceptable performance for drives below 200 Hp is provided by way of a single ground conductor.

Location	Cable Rating/Type	Description
Standard (Option 1)	1000V, 90 °C (194 °F) XHHW2/RHW-2 Anixter B29528-B29532, Belden 29528-29532, or equivalent	• Four tinned copper conductors with XLPE insulation. • Copper braid/aluminum foil combination shield and tinned copper drain wire. • PVC jacket.
Standard (Option 2)	Tray rated 1000V, 90 °C (194 °F) RHH/RHW-2 Anixter OLFLEX-76xxx03, or equivalent	• Three tinned copper conductors with XLPE insulation. • Corrugated copper tape with three bare copper grounds in contact with shield. • PVC jacket.
Class I & II; Division I & II	Tray rated 1000V, 90 °C (194 °F) RHH/RHW-2 Anixter 7VFD-xxxx, or equivalent	• Three bare copper conductors with XLPE insulation and impervious corrugated continuously welded aluminum armor. • Black sunlight resistant PVC jacket overall. • Three copper grounds.

Cable Trays and Conduit

If cable trays or large conduits are to be used, see the guidelines in Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001.

Fuse and Circuit Breaker Ratings

Most codes require that upstream branch circuit protection be provided to protect input power wiring. The frame 2 drive does not provide input power short circuit protection.

The tables on the following pages provide recommended AC line input fuse and circuit breaker information. See below for UL and IEC requirements. Sizes listed are the recommended sizes based on 40 °C (104 °F) and the U.S. NEC. Other country, state or local codes may require different ratings. Tables with DC link fuse recommendations for DC input drives are also provided.

Fusing

The recommended fuse types are listed below. If available current ratings do not match the tables provided, the next higher fuse rating should be chosen.

- IEC – BS88 (British Standard) Parts 1 & 2, EN60269-1, Parts 1 & 2 (1), type gG fuses or equivalent should be used.
- UL – UL Class T, J or L fuses should be used.

Circuit Breakers

The 'non-fuse' listings in the following tables include inverse time circuit breakers, instantaneous trip circuit breakers (motor circuit protectors), and 140M self-protected combination motor controllers. If one of these is chosen as the desired protection method, the following requirements apply.

- IEC – Both types of circuit breakers and 140M self-protected combination motor controllers are acceptable for IEC installations.
- UL – Only inverse time circuit breakers and the specified 140M self-protected combination motor controllers are acceptable for UL installations.

400 Volt AC Input Protection Devices

Drive Catalog Number	Frame	HP (kW) Rating		Input Rating	Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (5)
		ND	HD	Amps	Min. (1)	Max. (2)	Min.	Max.	Max. (4)	Max.
20LC360	2	268 (200)	—	360	500	750	500	900	900	600
		—	200 (150)	264	400	650	450	900	900	400

(1) Minimum protection device size is the lowest rated device that supplies maximum protection without nuisance tripping.
(2) Maximum protection device size is the highest rated device that supplies drive protection. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.
(3) Circuit Breaker - inverse time breaker. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum
(4) Maximum allowable rating by US NEC. Exact size must be chosen for each installation.
(5) Motor Circuit Protector - instantaneous trip circuit breaker. For US NEC minimum size is 125% of motor FLA. Ratings shown are maximum

480 Volt AC Input Protection Devices

Drive Catalog Number	Frame	HP (kW) Rating		Input Rating	Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (5)
		ND	HD	Amps	Min. (1)	Max. (2)	Min.	Max.	Max. (4)	Max.
20LD360	2	300 (224)	—	360	500	750	500	900	900	600
		—	235 (175)	264	400	650	450	900	900	400

(1) Minimum protection device size is the lowest rated device that supplies maximum protection without nuisance tripping.
(2) Maximum protection device size is the highest rated device that supplies drive protection. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.
(3) Circuit Breaker - inverse time breaker. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum
(4) Maximum allowable rating by US NEC. Exact size must be chosen for each installation.
(5) Motor Circuit Protector - instantaneous trip circuit breaker. For US NEC minimum size is 125% of motor FLA. Ratings shown are maximum

(1) Typical designations include, but may not be limited to the following; Parts 1 & 2: AC, AD, BC, BD, CD, DD, ED, EFS, EF, FF, FG, GF, GG, GH.

540 Volt DC Input Fusing

Drive Catalog Number	Frame	HP (kW) Rating		DC Input Rating	Bussmann Fuse	
		ND	HD	Amps	Amps	Catalog No.
20LC650	3A	500 (370)	365 (270)	1250 (1)	2000	170M6621 (2)
20LC1K2	3B	960 (715)	700 (525)	1250	2000	170M6621 (2)

(1) Only the Dual Inverter for PowerFlex 700L Frame 3A is available as a DC input inverter.
(2) Two 1000A Bussmann 170M6614 fuses per phase can also be used.

650 Volt DC Input Fusing

Drive Catalog Number	Frame	HP (kW) Rating		DC Input Rating	Bussmann Fuse	
		ND	HD	Amps	Amps	Catalog No.
20LD650	3A	600 (445)	440 (325)	1250 (1)	2000	170M6621 (2)
20LD1K2	3B	1150 (860)	845 (630)	1250	2000	170M6621 (2)

(1) Only the Dual Inverter for PowerFlex 700L Frame 3A is available as a DC input inverter.
(2) Two 1000A Bussmann 170M6614 fuses per phase can also be used.

810 Volt DC Input Fusing

Drive Catalog Number	Frame	HP (kW) Rating		DC Input Rating	Bussmann Fuse	
		ND	HD	Amps	Amps	Catalog No.
20LE425	3A	465 (345)	345 (255)	850 (1)	1400	170M6701 (2)
20LE800	3B	870 (650)	640 (480)	800	1250	170M6700 (3)
20LE1K1	3B	1275 (955)	935 (695)	1175	900 (2 per phase)	170M6697

(1) Only the Dual Inverter for PowerFlex 700L Frame 3A is available as a DC input inverter.
(2) Two 700A Bussmann 170M6695 fuses per phase can also be used.
(3) Two 630A Bussmann 170M6694 fuses per phase can also be used.

932 Volt DC Input Fusing

Drive Catalog Number	Frame	HP (kW) Rating		DC Input Rating	Bussmann Fuse	
		ND	HD	Amps	Amps	Catalog No.
20LF380	3A	475 (355)	350 (260)	760 (1)	1250	170M6700 (2)
20LF705	3B	881 (657)	650 (485)	705	1100	170M6699 (3)
20LF1K0	3B	1315 (980)	965 (720)	1050	800 (2 per phase)	170M6696

(1) Only the Dual Inverter for PowerFlex 700L Frame 3A is available as a DC input inverter.
(2) Two 630A Bussmann 170M6694 fuses per phase can also be used.
(3) Two 550A Bussmann 170M6693 fuses per phase can also be used.

Circuit Breakers for Frame 3A/3B Complete Drives

Frame 3A/3B complete drives include an input power circuit breaker. The value of the circuit breaker provided with the drive is listed in the table below.

Frame Size	Input Voltage	Circuit Breaker Provided	Shunt Trip Rating
3A	400…480V AC	800 A	65 kAIC
	575…690V AC	800 A	35 kAIC
3B	400…480V AC	1500 A	100 kAIC
	575…690V AC	1500 A	35 kAIC

Maximum Motor Cable Lengths

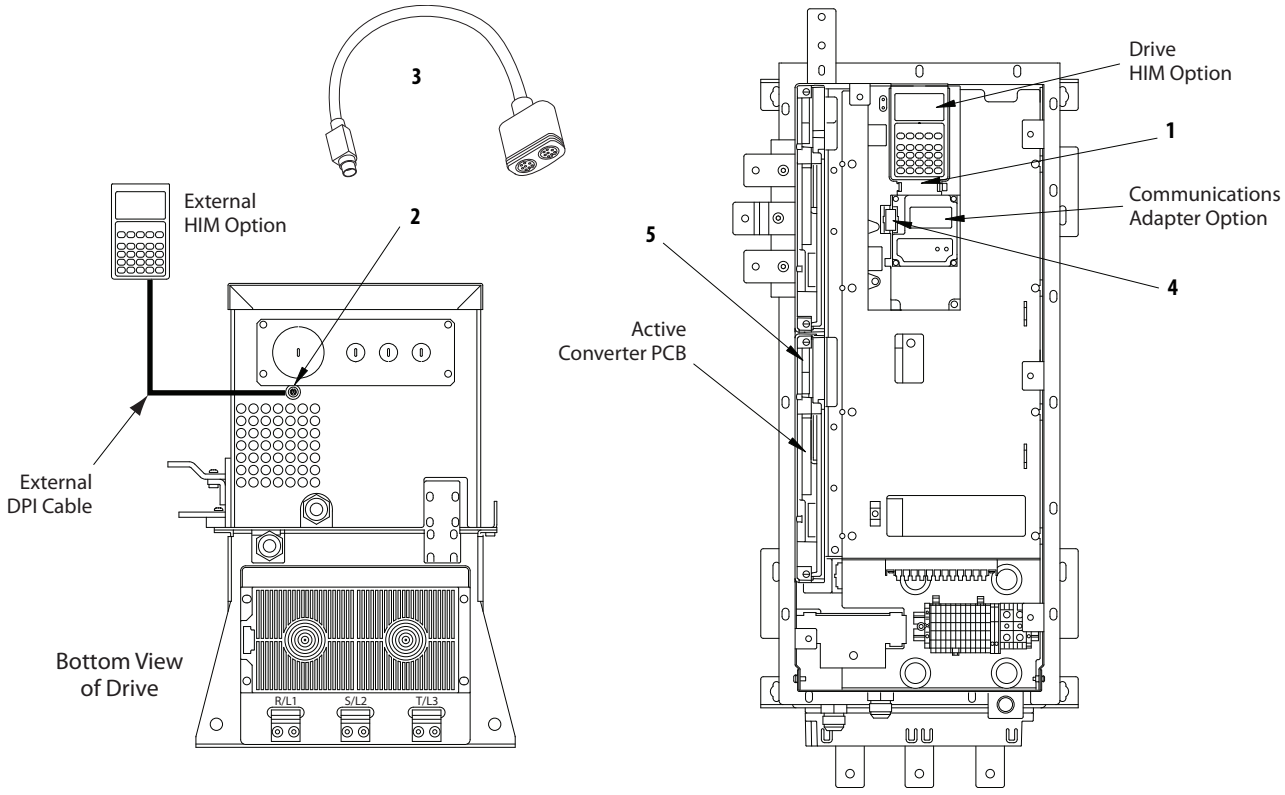
See the Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, Installation Instructions, publication DRIVES-IN001, for details on maximum motor cable lengths.

DPI Connections

Frame 2

Drive Connection Points

The PowerFlex 700L frame 2 drive provides a number of cable connection points as shown in the illustration. If an additional external HIM is required for the application, the HIM can be connected to the DPI port on the bottom of the drive. Only one additional external HIM device may be connected. The use of two external HIM devices is not supported. If multiple external HIM devices are required, then install a user-supplied splitter cable or splitter box.



Item	Connector	Description
1	DPI Port 1	HIM connection when installed in the drive.
2	DPI Port 2	Cable connection for handheld and remote options.
3	DPI Port 3 or 2	Splitter cable connection to DPI Port 2 provides additional port.
4	DPI Port 5	Cable connection for communications adapter.
5	DPI Port 6	Internal DPI connection to Active Converter pcb.

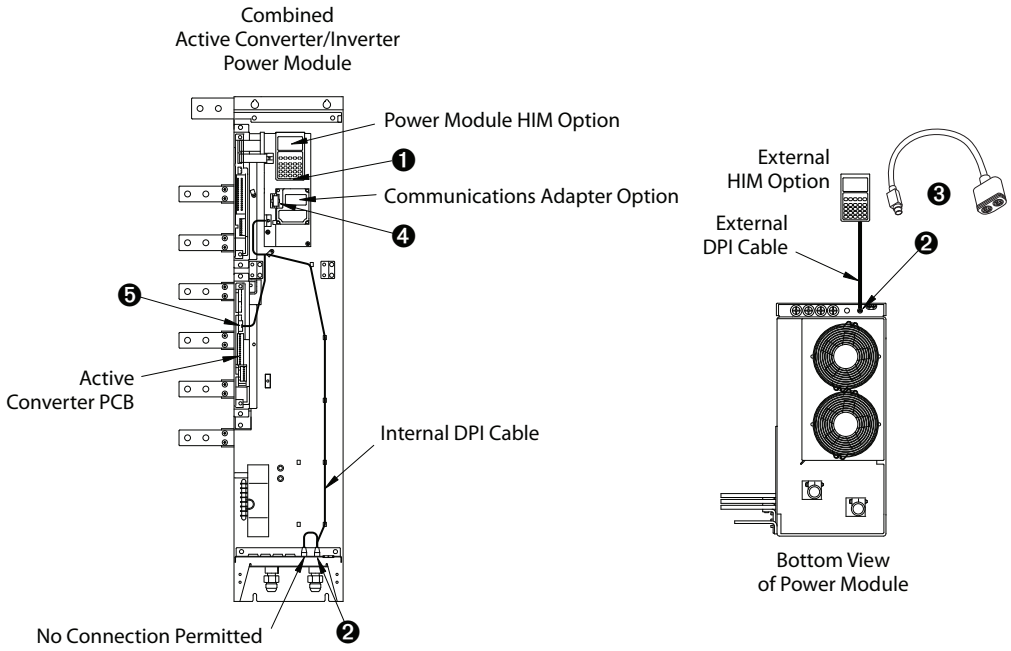
External Door-mounted HIM Connection (Optional)

For a frame 2 drive installed in a user-supplied enclosure, an optional external door-mounted HIM may be connected as an alternative to the external HIM option. The cable supplied with the door-mounted HIM option kit connects to the DPI port on the bottom of the drive (see drawing above). For additional installation information, see the instructions provided with the door-mount HIM option kit.

Frame 3A

Drive Connection Points

The PowerFlex 700L provides a number of cable connection points as shown in the drawing below. If an additional external HIM is required for the application, the HIM can be connected to the DPI port on the bottom of the power module. Only one additional external HIM device may be connected. The use of two external HIM devices is not supported. If multiple external HIM devices are required, then install a user-supplied splitter cable or splitter box.



Item	Connector	Description
❶	DPI Port 1	HIM connection when installed in power module.
❷	DPI Port 2	Cable connection for handheld and remote options.
❸	DPI Port 3 or 2	Splitter cable connected to DPI Port 2 provides an additional port.
❹	DPI Port 5	Cable connection for communications adapter.
❺	DPI Port 6	Internal DPI connection to Active Converter PCB.

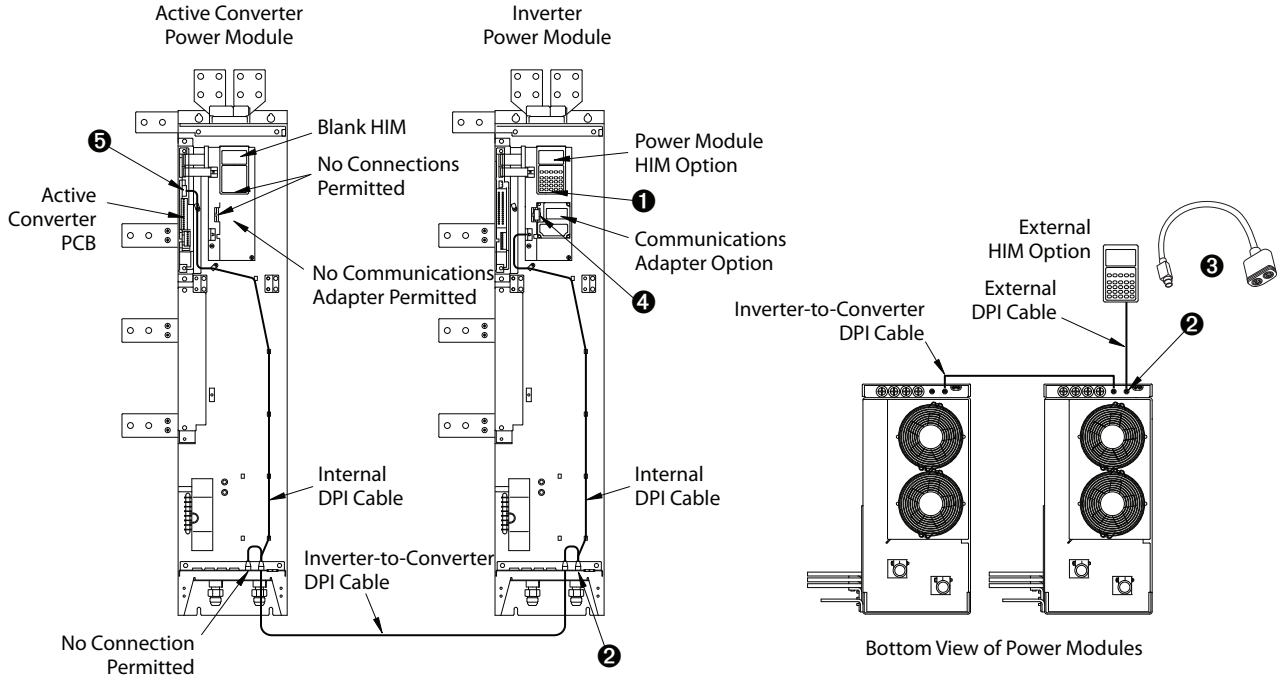
External Door-mounted HIM Connection (Optional)

For complete drives, the door-mounted HIM is standard equipment. It is located in the door mount bezel on the door of the power module bay.

Frame 3B

Drive Connection Points

The PowerFlex 700L provides a number of cable connection points as shown in the drawing below. If an additional external HIM is required for the application, the HIM can be connected to the DPI port on the bottom of the power module. Only one additional external HIM device may be connected. The use of two external HIM devices is not supported. If multiple external HIM devices are required, then install a user-supplied splitter cable or splitter box.



Item	Connector	Description
❶	DPI Port 1	HIM connection when installed in power module.
❷	DPI Port 2	Cable connection for handheld and remote options.
❸	DPI Port 3 or 2	Splitter cable connected to DPI Port 2 provides an additional port.
❹	DPI Port 5	Cable connection for communications adapter.
❺	DPI Port 6	Internal DPI connection to Active Converter PCB.

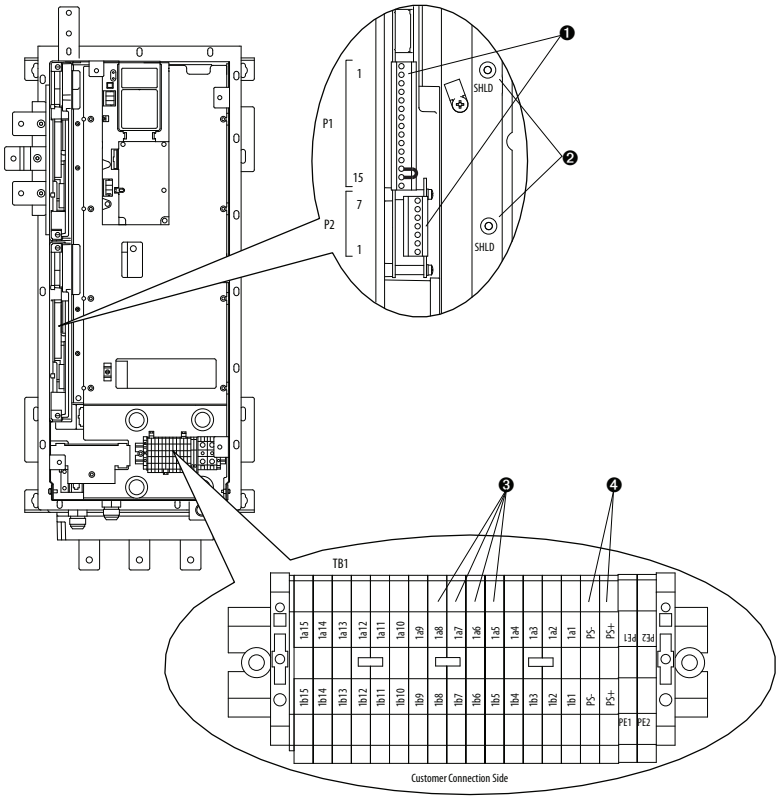
External Door-mounted HIM Connection (Optional)

For complete drives, the door-mounted HIM is standard equipment. It is located in the door mount bezel on the door of the power module bay.

Control Connections

Frame 2

Frame 2 Control Terminal Locations



Frame 2 Control Terminal Specifications

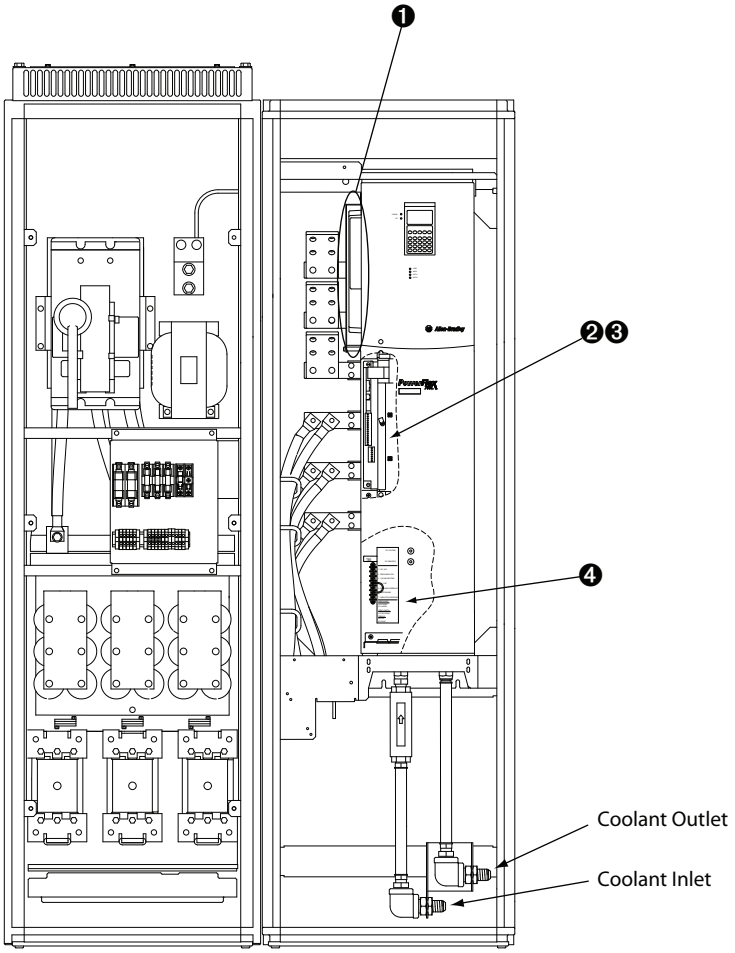
Item	Name	Description	Wire Size Range[1]		Recommended Tightening Torque (±10%)	Wire Strip Length
			Maximum	Minimum		
❶	PowerFlex 700 Vector Control or PowerFlex 700S Phase II Control Cassette Terminal Blocks	See PowerFlex 700 Series B Technical Data, publication 20B-TD001 or PowerFlex 700S Technical Data, publication 20D-TD002 respectively for details.				
❷	Active Converter Cassette Terminal Blocks — P1 & P2	Active Converter AC power and control wiring	3.3 mm^2 (#12 AWG)	0.3 mm^2 (#22 AWG)	0.8 N•m (7 lb•in)	8 mm (0.31 in.)
❸	SHLD Terminal	Terminating point for control wiring shields on the drive	2.1 mm^2 (#14 AWG)	0.3 mm^2 (#22 AWG)	1.4 N•m (12 lb•in)	10 mm (0.39 in.)
❹	Terminal Block — TB1 1b 5: +12/+24V Cooling Loop 1b 6: Cooling Loop Return	Drive control wiring: Output dry contact (12V DC/24V DC, 2 Amps max.) indicating the drive is powered and has completed precharge.	4.0 mm^2 (#10 AWG)	0.2 mm^2 (#24 AWG)	0.9 N•m (8 lb•in)	8 mm (0.31 in.)
	1b 7: +24V (digin)	Drive-supplied +24V DC				
	1b 8: Gate Enable	Enables the firing of the IGBTs. Factory-installed jumper from terminal 1b 7 to terminal 1b 8 allows firing of the IGBTs.				
❺	PS- Terminal PS+ Terminal	300V DC Auxiliary Control voltage	4.0 mm^2 (#12 AWG)	0.5 mm^2 (#22 AWG)	0.6 N•m (5.3 lb•in)	10 mm (0.39 in.)

(1) Maximum/minimum sizes that the terminals will accept - these are not recommendations.

Frame 3

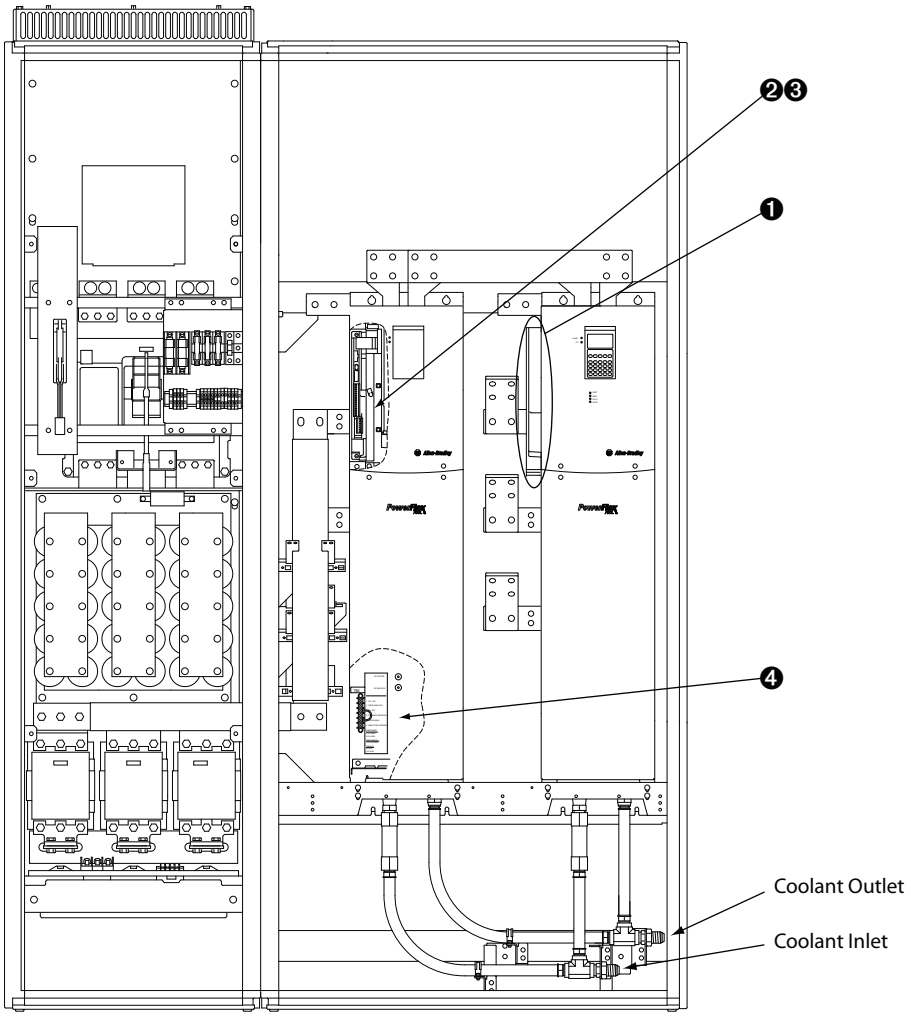
Frame 3A Control Terminal Locations

(Drive shown with doors removed)



Frame 3B Control Terminal Locations

(Drive shown with doors removed)



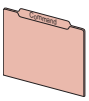
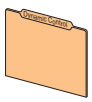
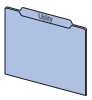
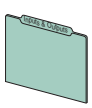
Frame 3A/3B Control Terminal Specifications

Item	Name	Description	Wire Size Range[1]		Recommended Tightening Torque (±10%)	Wire Strip Length	Wire Terminal
			Maximum	Minimum			
❶	PowerFlex 700 Vector Control or PowerFlex 700S Phase II Control Cassette Terminal Blocks	See PowerFlex 700 Series B Technical Data, publication 20B-TD001 or PowerFlex 700S Technical Data, publication 20D-TD002 respectively for details.					
❷	Active Converter Cassette Terminal Blocks — P1 & P2	Active Converter AC power and control wiring	3.3 mm^2 (#12 AWG)	0.3 mm^2 (#22 AWG)	0.8 N•m (7 lb•in)	8 mm (0.31 in.)	not applicable
❸	SHLD Terminal	Terminating point for control wiring shields on power module	2.1 mm^2 (#14 AWG)	0.3 mm^2 (#22 AWG)	1.4 N•m (12 lb•in)	10 mm (0.39 in.)	not applicable
❹	Terminal Blocks — TB5 and TB6	Power module control wiring	4.0 mm^2 (#10 AWG)	0.2 mm^2 (#24 AWG)	1.4 N•m (12 lb•in)	8 mm (0.31 in.)	not applicable

(1) Maximum/minimum sizes that the terminals will accept - these are not recommendations.

Control Highlights

Active Converter Control

File	Group	Parameters							
Monitor	Current	Rated Amps	001	Input Current T	004	Reactive Current	007		
		Input Current R	002	Ground Current	005	I Imbalance	008		
		Input Current S	003	Active Current	006	IT Overload	009		
	Voltage	Rated Volts	010	Input Voltage ST	012	DcLink Voltage	014	V Imbalance	016
		Input Voltage RS	011	Input Voltage TR	013	DcLink Ripple	015		
	Power & Time	Rated Power	020	Regen kWh	023	Life Run Time	026		
		AC Line kW	021	Lifetime kWh	024	Life Power Time	027		
		Motoring kWh	022	Elapsed Run Time	025	Life Pwr Cycles	028		
	Temperature	Ambient Temp	030	IGBT Base Temp	031	IGBT Junct Temp	032		
	Frequency	Line Frequency	040	Max Line Freq	042	Change Line Freq	044		
		Min Line Freq	041	Min Max Persist	043				
Command 	Start/Stop	Start Config	050	Option Select	051	Manual Control	052	Turn Off Delay	053
	Setpoints	DcLink Reference	060	Extern Cml Ref	062	Modulation Freq	064		
		kVAR Reference	061	Modulation Index	063				
	Data Exchange	Converter Control	070	Converter Status	071	Converter Min Vdc	072	Converter Fault	073
Limit Config	Current	Active I Lmt	100	Reactive RateLmt	102	I Imbalance Time	104		
		Active OL I Lmt	101	I Imbalance Lmt	103	Regen I Lmt	105		
	AC Line Voltage	Ride Through Ena	110	Low Vac Lmt	112	High Vac Lmt	114	V Imbalance Lmt	116
		Ride Through Sec	111	Low Vac Time	113	High Vac Time	115	V Imbalance Time	117
	Temperature	Ambnt Temp Alrm	120	Base Temp Alrm	122	Junct Temp Alrm	124	CldPlt Temp Alrm	126
		Ambnt Temp Trip	121	Base Temp Trip	123	Junct Temp Trip	125		
	Frequency	PWM Frequency	130	AC Low Freq Time	132	AC High Freq Time	134		
		AC Low Freq Lmt	131	AC High Freq Lmt	133	AC Maximum dF/dt	135		
Dynamic Control 	Current Loop	Reduce Ilmt Sel	150	CML Bandwidth	153	CML Kp	156	Reactive I Cmd	159
		Active I Cmd	151	CML Damping	154	PF Bandwidth	157		
		Inductance	152	CML Ki	155	Reactive I Lmt	158		
	Voltage Loop	Voltage Loop Sel	160	VML Bandwidth	163	VML Kp	166	Parallel Config	169
		DcLink Command	161	VML Damping	164	VML Kf	167	Bus Capacitance	170
		Capacitance	162	VML Ki	165	VML Reset Level	168		
Utility 	Drive Memory	Param Access Lvl	196	Reset Meters	200	Drive Checksum	203	Password	205
		Reset to Defaults	197	Language	201	Control SW Ver	204		
	Diagnostics	Alarm Status	211	Fault Amps T	223	Fault VoltsTR	228	Testpoint 2 Sel	236
		Start Inhibit	214	Fault Amps Q	224	Fault Volts Vdc	229	Testpoint 2 Data	237
		Fault Frequency	220	Fault Amps D	225	Fault Base Temp	230		
		Fault Amps R	221	Fault Volts RS	226	Testpoint 1 Sel	234		
		Fault Amps S	222	Fault Volts ST	227	Testpoint 1 Data	235		
	Fault Queue	Fault Config	238	Fault 1 Code	243	Fault 2 Time	246	Fault 4 Code	249
		Fault Clear	239	Fault 1 Time	244	Fault 3 Code	247	Fault 4 Time	250
		Power Up Marker	242	Fault 2 Code	245	Fault 3 Time	248	Alarm Config	260
Communication	Datalinks	Data In A1	300	Data In C1	304	Data Out A1	310	Data Out C1	314
		Data In A2	301	Data In C2	305	Data Out A2	311	Data Out C2	315
		Data In B1	302	Data In D1	306	Data Out B1	312	Data Out D1	316
		Data In B2	303	Data In D2	307	Data Out B2	313	Data Out D2	317
	DPI Status	Connect Status	320	CS Msg Tx Cnt	323	PC Msg Rx Cnt	326	CAN Bus Off Cnt	329
		DPI Error Out	321	CS Timeout Cnt	324	PC Msg Tx Cnt	327		
		CS Msg Rx Cnt	322	CS Msg Bad Cnt	325	PC Timeout Cnt	328		
	Masks & Owners	Logic Mask	340	Fault Clr Mask	342	Start Owner	344		
		Start Mask	341	Stop Owner	343	Fault Clr Owner	345		
	Security	Port Mask Act	346	Write Mask Cfg	347	Write Mask Act	348	Logic Mask Act	349
Inputs & Outputs 	Mux'ed Temps	IGBT NTC Temp1	330	IGBT NTC Temp4	333	IGBT NTC Temp6	336	Coldplate Temp2	339
		IGBT NTC Temp2	331	Coldplate Temp1	334	IGBT NTC Temp7	337		
		IGBT NTC Temp3	332	IGBT NTC Temp5	335	IGBT NTC Temp8	338		
	Digital Inputs	Dig In Status	350	Dig In Frc Mask	351	Dig In Frc Data	352		
	Digital Outputs	Dig Out Status	360	Dig Out Frc Mask	361	Dig Out Frc Data	362		

PowerFlex 700 Vector Control

Parameter 196 [Param Access Lvl] set to option 1 (Advanced).

File	Group	Parameters							
Monitor	Metering	Output Freq	001	Output Current	003	Elapsed MWh	009	Analog In2 Value	017
		Commanded Speed	002	Torque Current	004	Elapsed Run Time	010	Elapsed kWh	014
		Ramped Speed	022	Flux Current	005	MOP Reference	011	PTC HW Value	018
		Speed Reference	023	Output Voltage	006	DC Bus Voltage	012	Spd Fdbk No Filt	021
		Commanded Torque**	024	Output Power	007	DC Bus Memory	013		
		Speed Feedback	025	Output Powr Fctr	008	Analog In1 Value	016		
	Drive Data	Rated kW	026	Rated Volts	027	Rated Amps	028	Control SW Ver	029
Motor Control	Motor Data	Motor Type	040	Motor NP Hertz	043	Mtr NP Pwr Units	046	Motor OL Mode [6.x]	050
		Motor NP Volts	041	Motor NP RPM	044	Motor OL Hertz	047	Motor Poles	049
		Motor NP FLA	042	Motor NP Power	045	Motor OL Factor	048		
	Torq Attributes	Motor Cntl Sel	053	IR Voltage Drop	062	Torq Ref A Div**	430	Neg Torque Limit**	437
		Maximum Voltage	054	Flux Current Ref	063	Torque Ref B Sel**	431	Control Status**	440
		Maximum Freq	055	IXo Voltage Drop	064	Torque Ref B Hi**	432	Mtr Tor Cur Ref**	441
		Compensation	056	Autotune Torque**	066	Torque Ref B Lo**	433		
		Flux Up Mode	057	Inertia Autotune**	067	Torq Ref B Mult**	434		
		Flux Up Time	058	Torque Ref A Sel**	427	Torque Setpoint 1**	435		
		SV Boost Filter	059	Torque Ref A Hi**	428	Torque Setpoint 2**	438		
		Autotune	061	Torque Ref A Lo**	429	Pos Torque Limit**	436		
	Volts per Hertz	Start/Acc Boost	069	Run Boost*	070	Break Voltage*	071	Break Frequency*	072
	Speed Feedback	Motor Fdbk Type	412	Encoder Speed	415	Notch Filter K**	420	Encoder Z Chan	423
		Encoder PPR	413	Fdbk Filter Sel	416	Marker Pulse	421		
		Enc Position Fdbk	414	Notch Filter Freq**	419	Pulse In Scale	422		
Speed Command	Spd Mode & Limits	Speed Units	079	Maximum Speed	082	Skip Frequency 2*	085	Speed/Torque Mod**	088
		Feedback Select	080	Overspeed Limit	083	Skip Frequency 3*	086	Rev Speed Limit**	454
		Minimum Speed	081	Skip Frequency 1*	084	Skip Freq Band*	087		
	Speed References	Speed Ref A Sel	090	Speed Ref B Sel	093	TB Man Ref Sel	096	Pulse Input Ref	099
		Speed Ref A Hi	091	Speed Ref B Hi	094	TB Man Ref Hi	097		
		Speed Ref A Lo	092	Speed Ref B Lo	095	TB Man Ref Lo	098		
	Discrete Speeds	Jog Speed 1	100	Preset Speed 3	103	Preset Speed 6	106		
		Preset Speed 1	101	Preset Speed 4	104	Preset Speed 7	107		
		Preset Speed 2	102	Preset Speed 5	105	Jog Speed 2	108		
	Speed Trim	Trim In Select	117	Trim Hi	119	Trim % Setpoint	116		
		Trim Out Select	118	Trim Lo	120				
	Slip Comp	Slip RPM @ FLA	121	Slip Comp Gain*	122	Slip RPM Meter	123		
	Process PI	PI Configuration	124	PI Prop Gain	130	PI Fdback Meter	136	PI Feedback Lo	463
		PI Control	125	PI Lower Limit	131	PI Error Meter	137	PI BW Filter	139
		PI Reference Sel	126	PI Upper Limit	132	PI Output Meter	138	PI Deriv Time	459
		PI Setpoint	127	PI Preload	133	PI Reference Hi	460	PI Output Gain	464
		PI Feedback Sel	128	PI Status	134	PI Reference Lo	461		
		PI Integral Time	129	PI Ref Meter	135	PI Feedback Hi	462		
	Speed Regulator	Ki Speed Loop**	445	Kf Speed Loop**	447	Speed Desired BW**	449	Speed Loop Meter**	451
		Kp Speed Loop**	446	Speed Err Filt BW [6.x]	448	Total Inertia**	450		
Dynamic Control	Ramp Rates	Accel Time 1	140	Decel Time 1	142	S Curve %	146		
		Accel Time 2	141	Decel Time 2	143				
	Load Limits	Current Lmt Sel	147	Current Lmt Gain	149	PWM Frequency	151	Regen Power Limit**	153
		Current Lmt Val	148	Drive OL Mode	150	Droop RPM @ FLA	152	Current Rate Limit**	154
	Stop/Brake Modes	DB While Stopped	145	DC Brake Level	158	Bus Reg Mode B	162	Flux Braking	166
		Stop Mode A	155	DC Brake Time	159	DB Resistor Type	163	Stop Dwell Time	452
		Stop Mode B	156	Bus Reg Ki*	160	Bus Reg Kp*	164		
		DC Brk Lvl Sel	157	Bus Reg Mode A	161	Bus Reg Kd*	165		
	Restart Modes	Start At PowerUp	168	Auto Rstrt Tries	174	Sleep-Wake Ref	179	Sleep Level	182
		Flying Start En	169	Auto Rstrt Delay	175	Wake Level	180	Sleep Time	183
		Flying StartGain	170	Sleep-Wake Mode	178	Wake Time	181	Powerup Delay	167
	Power Loss	Power Loss Mode	184	Power Loss Level	186	Load Loss Time	188	Gnd Warn Level	177
		Power Loss Time	185	Load Loss Level	187	Shear Pin Time	189		
Utility	Direction Config	Direction Mode	190						
	HIM Ref Config	DPI Loss Action	173	Save HIM Ref	192	Man Ref Preload	193		
	MOP Config	Save MOP Ref	194	MOP Rate	195				
	Drive Memory	Param Access Lvl	196	Save To User Set	199	Voltage Class	202	Dyn UserSet Sel	205
		Reset To Defalts	197	Reset Meters	200	Drive Checksum	203	Dyn UserSet Actv	206
		Load Frm Usr Set	198	Language	201	Dyn UserSet Cnfg	204		

File	Group	Parameters							
Utility (continued)	Diagnostics	Drive Status 1	209	Last Stop Source	215	Fault Amps	225	Testpoint 1 Sel	234
		Drive Status 2	210	Dig In Status	216	Fault Bus Volts	226	Testpoint 2 Sel	236
		Drive Status 3 [6.x]	222	Dig Out Status	217	Status 1 @ Fault	227	Testpoint 1 Data	235
		Drive Alarm 1	211	Drive Temp	218	Status 2 @ Fault	228	Testpoint 2 Data	237
		Drive Alarm 2	212	Drive OL Count	219	Status 3 @ Fault [6.x]	223	Mtr OL Trip Time	221
		Speed Ref Source	213	Motor OL Count	220	Alarm 1 @ Fault	229		
		Start Inhibits	214	Fault Speed	224	Alarm 2 @ Fault	230		
	Faults	Fault Config 1	238	Fault 1 Time	244	Fault 4 Code	249	Fault 6 Time	254
		Fault Clear	240	Fault 2 Code	245	Fault 4 Time	250	Fault 7 Code	255
		Fault Clear Mode	241	Fault 2 Time	246	Fault 5 Code	251	Fault 7 Time	256
		Power Up Marker	242	Fault 3 Code	247	Fault 5 Time	252	Fault 8 Code	257
		Fault 1 Code	243	Fault 3 Time	248	Fault 6 Code	253	Fault 8 Time	258
	Alarms	Alarm Config 1	259	Alarm 2 Code	263	Alarm 5 Code	266	Alarm 8 Code	269
		Alarm Clear	261	Alarm 3 Code	264	Alarm 6 Code	267		
		Alarm 1 Code	262	Alarm 4 Code	265	Alarm 7 Code	268		
	Scaled Blocks	Scale1 In Value	476	Scale2 In Value	482	Scale3 In Value	488	Scale4 In Value	494
		Scale1 In Hi	477	Scale2 In Hi	483	Scale3 In Hi	489	Scale4 In Hi	495
		Scale1 In Lo	478	Scale2 In Lo	484	Scale3 In Lo	490	Scale4 In Lo	496
		Scale1 Out Hi	479	Scale2 Out Hi	485	Scale3 Out Hi	491	Scale4 Out Hi	497
		Scale1 Out Lo	480	Scale2 Out Lo	486	Scale3 Out Lo	492	Scale4 Out Lo	498
		Scale1 Out Value	481	Scale2 Out Value	487	Scale3 Out Value	493	Scale4 Out Value	499
Communication	Comm Control	DPI Baud Rate	270	Drive Ref Rslt	272	DPI Port Sel	274	DPI Ref Select	298
		Drive Logic Rslt	271	Drive Ramp Rslt	273	DPI Port Value	275	DPI Fdbk Select	299
	Masks & Owners	Logic Mask	276	Accel Mask	281	Stop Owner	288	Accel Owner	293
		Start Mask	277	Decel Mask	282	Start Owner	289	Decel Owner	294
		Jog Mask	278	Fault Clr Mask	283	Jog Owner	290	Fault Clr Owner	295
		Direction Mask	279	MOP Mask	284	Direction Owner	291	MOP Owner	296
		Reference Mask	280	Local Mask	285	Reference Owner	292	Local Owner	297
	Datalinks	Data In A1	300	Data In C2	305	Data Out B1	312	Data Out D2	317
		Data In A2	301	Data In D1	306	Data Out B2	313	HighRes Ref [6.x]	308
		Data In B1	302	Data In D2	307	Data Out C1	314		
		Data In B2	303	Data Out A1	310	Data Out C2	315		
		Data In C1	304	Data Out A2	311	Data Out D1	316		
	Security	Port Mask Act	595	Write Mask Act	597	Logic Mask Act	598		
		Write Mask Cfg	596	Logic Mask	276				
Inputs & Outputs	Analog Inputs	Anlg In Config	320	Analog In1 Hi	322	Analog In1 Loss	324	Analog In2 Lo	326
		Anlg In Sqr Root	321	Analog In1 Lo	323	Analog In2 Hi	325	Analog In2 Loss	327
	Analog Outputs	Anlg Out Config	340	Analog Out1 Hi	343	Analog Out2 Hi	346	Anlg Out2 Scale	355
		Anlg Out Absolut	341	Analog Out1 Lo	344	Analog Out2 Lo	347	Anlg1 Out Setpt	377
		Analog Out1 Sel	342	Analog Out2 Sel	345	Anlg Out1 Scale	354	Anlg2 Out Setpt	378
	Digital Inputs	Digital In1 Sel	361	Digital In3 Sel	363	Digital In5 Sel	365	DigIn DataLogic [6.x]	411
		Digital In2 Sel	362	Digital In4 Sel	364	Digital In6 Sel	366		
	Digital Outputs	Dig Out Setpt	379	Dig Out1 OffTime	383	Dig Out2 OffTime	387	Dig Out3 OffTime	391
		Digital Out1 Sel	380	Digital Out2 Sel	384	Digital Out3 Sel	388	Dig Out Invert	392
		Dig Out1 Level	381	Dig Out2 Level	385	Dig Out3 Level	389	Dig Out Param	393
		Dig Out1 OnTime	382	Dig Out2 OnTime	386	Dig Out3 OnTime	390	Dig Out Mask	394
Applications	Torq Proving	TorqProve Cnfg	600	Brk Release Time	604	TorqLim SlewRate	608	Torq Prove Sts	612
		TorqProve Setup	601	ZeroSpdFloatTime	605	BrkSlip Count	609	Brake Test Torq [6.x]	613
		Spd Dev Band	602	Float Tolerance	606	Brk Alarm Travel	610		
		SpdBand Integrat	603	Brk Set Time	607	MicroPos Scale%	611		
	Adjust Voltage	Adj Volt Phase	650	Adj Volt Preset 3	656	Adj Volt Command	662	Adj Volt AccTime	675
		Adj Volt Select	651	Adj Volt Preset 4	657	MOP Adj VoltRate	663	Adj Volt DecTime	676
		Adj Volt Ref Hi	652	Adj Volt Preset 5	658	Adj Volt TrimSel	669	Adj Volt S Curve	677
		Adj Volt Ref Lo	653	Adj Volt Preset 6	659	Adj Volt Trim Hi	670		
		Adj Volt Preset 1	654	Adj Volt Preset 7	660	Adj Volt Trim Lo	671		
		Adj Volt Preset 2	655	Min Adj Voltage	661	Adj Volt Trim %	672		
	Oil Well Pump	Max Rod Torque	631	TorqAlrm TO Act	636	OilWell Pump Sel	641	Total Gear Ratio	646
		TorqAlarm Level	632	PCP Pump Sheave	637	Gearbox Rating	642	DB Resistor	647
		TorqAlarm Action	633	PCP Rod Torque	638	Gearbox Sheave	643	Gearbox Limit	648
		TorqAlarm Dwell	634	Min Rod Speed	639	Gearbox Ratio	644		
		TorqAlrm Timeout	635	Max Rod Speed	640	Motor Sheave	645		
Pos/Spd Profile	ProfSetup/Status	Pos/Spd Prof Sts	700	Pos/Spd Prof Cmd	705	Vel Override	711	Pos Reg Filter	718
		Units Traveled	701	Encoder Pos Tol	707	Find Home Speed	713	Pos Reg Gain	719
		Home Position [6.x]	702	Counts Per Unit	708	Find Home Ramp	714		
	Profile Step 1-16	Step x Type	720…	Step x AccelTime	722…	Step x Value	724…	Step x Batch	726…
		Step x Velocity	721…	Step x DecelTime	723…	Step x Dwell	725…	Step x Next	727…

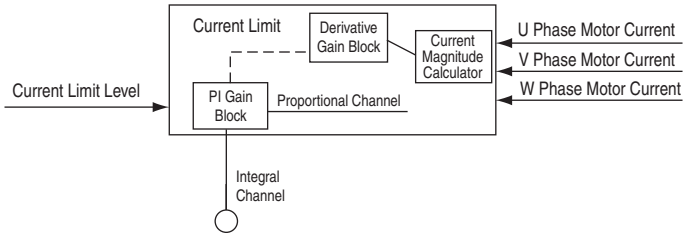
*These parameters will **only** be displayed when parameter 053 [Motor Cntl Sel] is set to option '2' (Custom V/Hz) or '3' (Fan/Pump V/Hz).

These parameters will **only be displayed when parameter 053 [Motor Cntl Sel] is set to option '4' (FVC Vector).

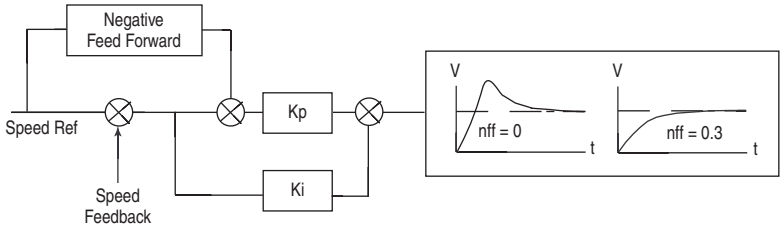
[6.x]Firmware revision 6.002 or later.

PowerFlex 700S Phase II Control

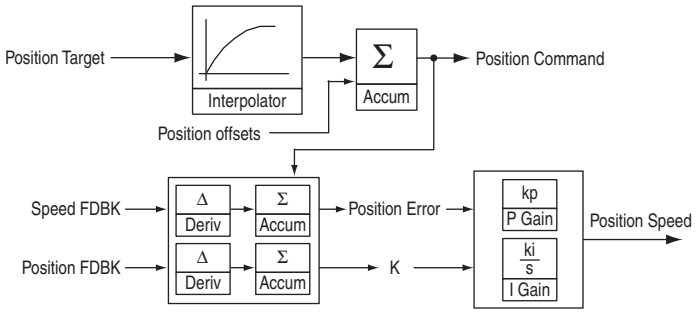
Digital Current Regulator outperforms older style analog regulators in speed, repeatability and drift.



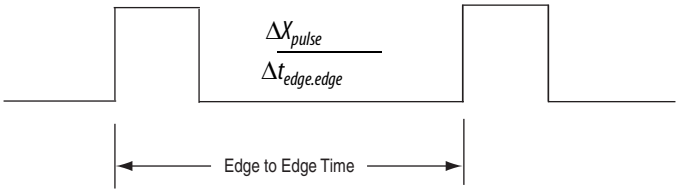
Negative Feed Forward reduces or eliminates overshoot during step speed changes. Helpful in preventing backup during stopping.



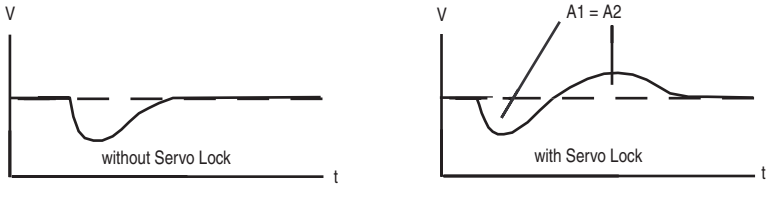
Coarse-to-Fine interpolation for **DriveLogix Motion**, direct positioning for precise control and point-to-point for indexing are all features of the **Integral Position Loop.** The loop easily handles applications such as simple indexing and electronic line shaft.



Advanced **Edge-to-Edge Algorithms** and pulse position averaging provides extremely accurate speed measurement and excellent performance at very low speed.

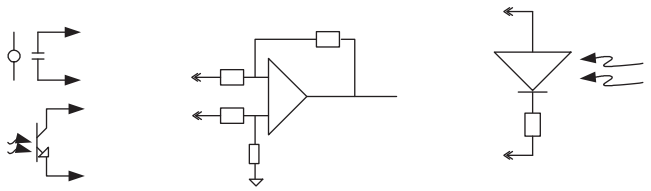


Servo Lock compensates for lost position during step loads to the velocity regulator. Offers optimum performance for draw applications and others.

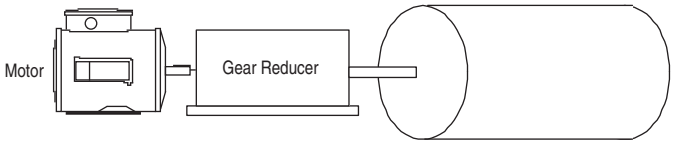


Velocity Response to Step Load

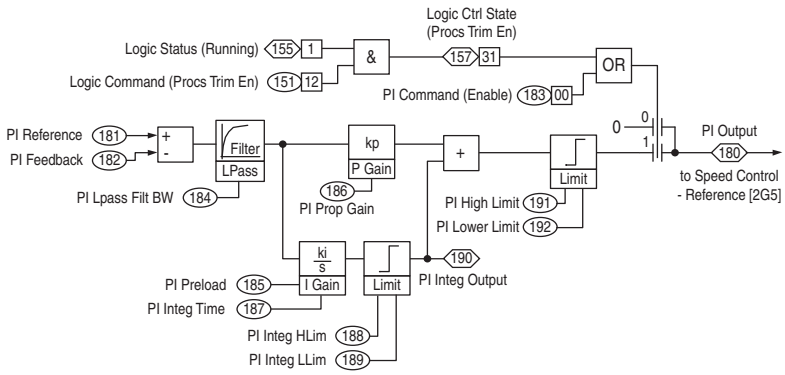
High Speed Analog & Digital I/O execute in 0.5 mSec or less to provide fast response and fast capture for registration information and position data. Output relays, optically isolated and differentially isolated I/O are supplied.



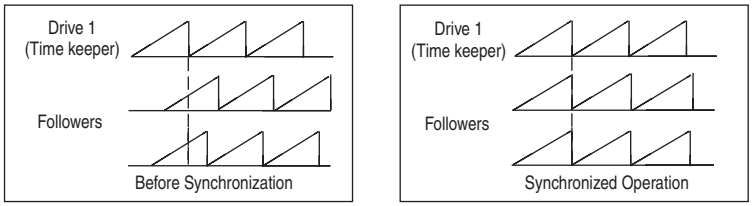
Inertia Adaptation stabilizes inertia disconnect due to gear boxes or flexible couplings. It also provides broadband resonance compensation, allowing up to 4 times improvement to speed regulator bandwidth.



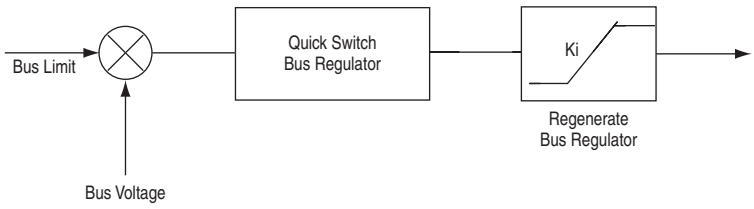
An **Enhanced Process Loop** executes six times faster than previous loops, providing greatly improved dynamic response in tension control applications.



The **Control Loops** within each drive are **Synchronized**. In addition, the control loops for all drives on SynchLink are synchronized within micro-seconds. This provides exceptional link coordination and tracking for critical applications.



The **Enhanced Bus Regulator** reacts four times faster than previous products, providing quicker stops without over-voltage issues and outstanding performance in other regenerative applications.



Standard Drive Specifications

Category	Specification		
		Frame 2	Frame 3A/3B
Agency Certification	c UL us	Listed to UL508C and CAN/CSA-C2.2 No. 14-05. UL Listing for frame 2 is applicable up to 480V AC. UL Listing for frame 3A and 3B is applicable up to 600V AC.	
	CE	Marked for all applicable European Directives (1) EMC Directive (89/336/EEC) EN 61800-3 Adjustable Speed electrical power drive systems Low Voltage Directive (73/23/EEC) EN 61800-5-1 Electronic Equipment for use in Power Installations	
	N223	Certified to AS/NZS, 1997 Group 1, Class A.	
	These drives are also designed to meet the following specifications: NFPA 70 - US National Electrical Code NEMA ICS 3.1 - Safety standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems. IEC 146 - International Electrical Code. CMAA Specification #70 (Crane Manufacturers of America Association)		

(1) Applied noise impulses may be counted in addition to the standard pulse train causing erroneously high [Pulse Freq] readings.

Unless otherwise noted, the following specifications pertain to PowerFlex 700L drives equipped with 700 Vector Control or 700S Phase II Control.

Category	Specification						
		Frame 2		Frame 3A/3B			
Protection		400V	480V	400V	480V	600V	690V
	AC Input Overvoltage Trip:	528V AC	528V AC	528V AC	528V AC	760V AC	760V AC
	AC Input Undervoltage Trip:	340V AC	340V AC	340V AC	340V AC	340V AC	340V AC
	Bus Overvoltage Trip:	815V DC	815V DC	815V DC	815V DC	1168V DC	1168V DC
	Bus Undervoltage Shutoff/Fault:	300V DC	300V DC	300V DC	300V DC	300V DC	300V DC
	Nominal Bus Voltage:	600V DC	700V DC	600V DC	700V DC	900V DC	1000V DC
	Heat Sink Thermistor:	Monitored by microprocessor overtemp trip					
	Drive Overcurrent Trip Software Overcurrent Trip: Hardware Overcurrent Trip:	 200% of rated current (typical) 220…300% of rated current (dependent on drive rating)					
	Line Transients:	Up to 6000 volts peak per IEEE C62.41-1991					
	Control Logic Noise Immunity:	Showering arc transients up to 1500V peak					
	Logic Control Ride-Thru Vector Control: 700S Phase II Control:	 0.5 seconds minimum, 2 seconds typical 0.25 seconds, drive not running					
	Ground Fault Trip:	Phase-to-ground on drive output					
	Short Circuit Trip:	Phase-to-phase on drive output					

Category	Specification		
		Frame 2	**Frame 3A/3B**
Environment	Altitude:	1000 m (3280 ft) at rated current. See Derating Guidelines on page 38 for operation above 1000 m (3280 ft).	
	Maximum Surrounding Air Temperature w/o Derating: IP20, NEMA/UL Type 1:	0…50 °C (32…122 °F)	0…40 °C (32…104 °F)
	Storage Temperature (all constructions):	–40…85 °C (–40…185 °F)	
	Atmosphere:	**Important:** Drive **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the drive is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.	
	Relative Humidity:	5…95% non-condensing	
	Shock:	10 g peak for 11 milliseconds duration (± 1.0 ms)	
	Vibration:	0.152 mm (0.006 in.) displacement, 1 g peak, 5.5 Hz	
Electrical	Voltage Tolerance Vector Control:	For full power and operating range, see the PowerFlex 700 Adjustable Frequency AC Drive — Series B User Manual, publication 20B-UM002, Appendix C.	
	700S Phase II Control:	For full power and operating range, see the PowerFlex 700S High Performance AC Drive — Phase II Control User Manual, publication 20D-UM006, Appendix C.	
	Input Frequency Tolerance:	27…93 Hz.	
	Input Phases:	Three-phase input provides full rating for all drives.	
	Displacement Power Factor:	0.98 across entire speed range.	
	Efficiency:	96.2% at rated amps, nominal line volts.	97.5% at rated amps, nominal line volts.
	Maximum Short Circuit Current Rating:	To match specified circuit breaker capability, less than or equal to 200,000 Amps Symmetrical	
	Actual Short Circuit Rating:	Determined by AIC rating of installed circuit breaker.	
	Motor Lead Lengths:	76 meters (250 feet) total	

Category	Specification		
		Frame 2	**Frame 3A/3B**
Control	Method:	Sine coded PWM with programmable carrier frequency.	
	Carrier Frequency:	2, 4, or 8 kHz. Drive rating based on 4 kHz. See Derating Guidelines on page 38 for more information.	2 or 4 kHz. Drive rating based on 4 kHz.
	Output Voltage Range:	0 to rated motor voltage	
	Output Frequency Range Vector Control: 700S Phase II Control:	 0…420 Hz 0…350 Hz	
	Frequency Accuracy (Vector Control only) Digital Input: Analog Input:	 Within ± 0.01% of set output frequency. Within ± 0.4% of maximum output frequency	
	Frequency Control (Vector Control only):	Speed Regulation - w/Slip Compensation (Volts per Hertz Mode) 0.5% of base speed across 40:1 speed range 40:1 operating range 10 rad/sec bandwidth Speed Regulation - w/Slip Compensation (Sensorless Vector Mode) 0.5% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth	
	Speed Control Vector Control: 700S Phase II Control:	 Speed Regulation - without feedback (Vector Control Mode) 0.1% of base speed across 120:1 speed range 120:1 operating range 50 rad/sec bandwidth Speed Regulation - with feedback (Vector Control Mode) 0.001% of base speed across 120:1 speed range 1000:1 operating range 250 rad/sec bandwidth Speed Regulation - without feedback 0.1% of base speed across 120:1 speed range 120:1 operating range 50 rad/sec bandwidth Speed Regulation - with feedback 0.001% of base speed across 120:1 speed range 1000:1 operating range 740 rad/sec bandwidth	
	Torque Regulation Vector Control: 700S Phase II Control:	 Torque regulation without Feedback; ± 5%, 600 rad/sec bandwidth Torque regulation with Feedback; ± 2%, 2500 rad/sec bandwidth Torque regulation without Feedback; ± 10%, 600 rad/sec bandwidth Torque regulation with Feedback; ± 5%, 4400 rad/sec bandwidth	
	Selectable Motor Control Vector Control: 700S Phase II Control:	 Sensorless Vector with full tuning. Standard V/Hz with full custom capability and Vector Control with Force Technology (with and without feedback). Vector Control with Force Technology (with and without feedback), V/Hz Control, and permanent magnet motor control.	

Category	Specification		
		Frame 2	**Frame 3A/3B**
Control (continued)	Stop Modes		
	Vector Control:	Multiple programmable stop modes including Ramp, Coast, DC-Brake, Ramp-to-Hold, and S-curve.	
	700S Phase II Control:	Multiple programmable stop modes including Ramp, Coast, and Current Limit.	
	Accel/Decel		
	Vector Control:	Two independently programmable accel and decel times. Each time may be programmed from 0-3600 seconds in 0.1 second increments.	
	700S Phase II Control:	Independently programmable accel and decel times, adjustable from 0-6553.5 seconds in 0.01 second increments.	
	Intermittent Overload:	110% Overload capability for up to 1 minute 150% Overload capability for up to 3 seconds	
	Current Limit Capability		
	Vector Control:	Proactive Current Limit programmable from 20…160% of rated output current. Independently programmable proportional and integral gain.	
	700S Phase II Control:	Independent Motoring and Regenerative Power Limits programmable to 800% of rated output current.	
	Electronic Motor Overload Protection:	Class 10 motor overload protection according to NEC article 430 and motor over-temperature protection according to NEC article 430.126 (A)(2). UL File E59272.	
Encoder (Vector Control only)	Type:	Incremental, dual channel	
	Supply:	12V or 5V, 250 mA. 12V or 5V, 10 mA minimum inputs isolated with differential transmitter, 250 kHz maximum.	
	Quadrature:	90°, ± 27° at 25 °C	
	Duty Cycle:	50%, ± 10%	
	Requirements:	Encoders must be line driver type, quadrature (dual channel) or pulse (single channel), 8…15V DC output (3.5…6V DC for 5V encoder), single-ended or differential, and capable of supplying a minimum of 10 mA per channel. Maximum input frequency is 250 kHz. The Encoder Interface Board accepts 12V DC or 5V DC square-wave with a minimum high state of 7.0V DC (12 volt encoder) or 3.1V DC (5 volt encoder). Maximum low state voltage is 0.4V DC.	
Feedback (700S Phase II Control only)	Encoder Input:	Dual Channel Plus Marker, Isolated with differential transmitter Output (Line Drive) Incremental, Dual Channel Quadrature type	
	Encoder Voltage Supply:	5V DC or 12V DC (5V DC requires an external power supply), 320 mA/channel	
	Maximum Input Freq:	400 kHz	
	Stegmann Hi-Resolution Option		
	Encoder Voltage Supply:	11.5V DC @ 130 mA	
	Hi-Resolution Feedback:	Sine/Cosine 1V P-P Offset 2.5	
	Maximum Cable Length:	182 m (600 ft)	
	RS-485 Interface:	Hi-Resolution Feedback Option card obtains the following information via the Hiperface RS-485 interface shortly after power-up: Address, Command Number, Mode, Number of Turns, Number of Sine/Cos cycles, and Checksum.	
	Customer-I/O Plug (P1) - Hi Res:	Allen-Bradley PN: S94262912 Weidmuller PN: BL3.50/90/12BK	
	Resolver Option		
	Excitation Frequency:	2400 Hz	
	Excitation Voltage:	4.25…26 Vrms	
	Operating Freq. Range:	1…10 kHz	
	Resolver Fdbk. Voltage:	2V ± 300mV	
	Maximum Cable Length:	304.8 m (1000 ft)	
DriveLogix (700S Phase II Control only)	User Available Memory Base:	1.5 megabytes	
	Battery:	1756-BA1 (Allen-Bradley P/N 94194801) 0.59g lithium	
	Serial Cable:	1761-CBLPM02 to 1761-NET-AIC 1761-CBLPA00 to 1761-NET-AIC 1756-CP3 directly to controller 1747-CP3 directly to controller Category 3 (2)	
	Compact I/O Connection:	Up to (30) modules	
	Cable:	20D-DL2-CL3 20D-DL2-CR3	

Derating Guidelines

Altitude

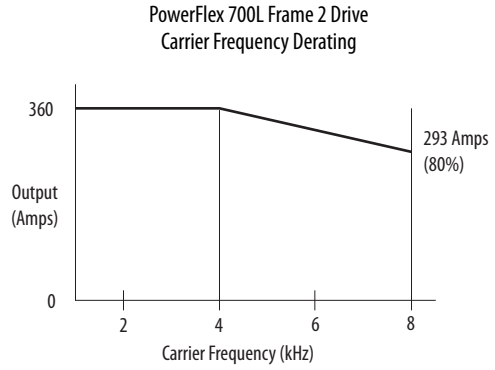
Above 1000 m (3280 ft), derate the output current by 1% for every 100 additional meters (328 additional feet). This is applicable to filters and power modules. PowerFlex 700L 600/690V drives cannot be used in altitudes above 2000 m (6562 ft) due to voltage spacing requirements.

Ambient

Frame 2 drives have a maximum ambient of 50 °C (122 °F). Frame 3A and 3B drives have a maximum ambient of 40 °C (104 °F). PowerFlex 700L drives cannot be derated to operate at higher temperatures.

Carrier Frequency

For frame 2 drives, see the carrier frequency derating table below. PowerFlex 700L frame 3A and 3B drives cannot be run above 4 kHz.



Watts Loss

Watts loss data is shown at Rated Load, Speed, and PWM Carrier Frequency.

Frame Size	Voltage	PWM Freq.	Watts Loss					
			Filter Section	Power Section			Complete Drive	
			Into Air	Into Air	Into Liquid	Total	Total Air	Total Liquid
2	400V	4 kHz	Not Applicable				1500	7900
	480V	4 kHz	Not Applicable				1500	7900
3A	400V	4 kHz	4000	1000	10,500	11,500	5000	10,500
	480V	4 kHz	4000	1000	11,500	12,500	5000	11,500
	600V	4 kHz	4000	1200	10,500	11,700	5200	10,500
	690V	4 kHz	4000	1200	12,000	13,200	5200	12,000
3B (1)	400V	4 kHz	7800	2000	21,000	23,000	9800	21,000
	480V	4 kHz	7800	2000	23,000	25,000	9800	23,000
	600V	4 kHz	7800	2400	21,000	23,400	10,200	21,000
	690V	4 kHz	7800	2400	24,000	26,400	10,200	24,000

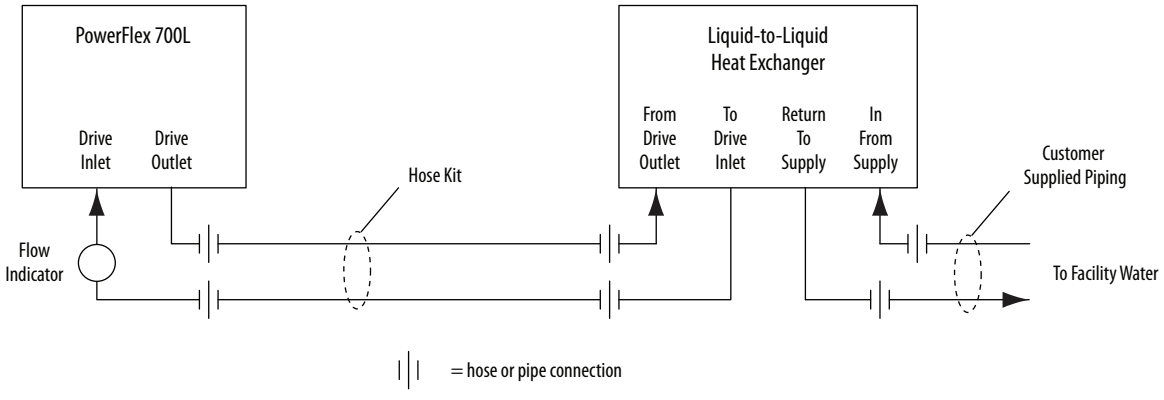
(1) Frame 3B power section consists of two power modules. Each module dissipates half (½) of the watts shown in this table.

Cooling Loop Options

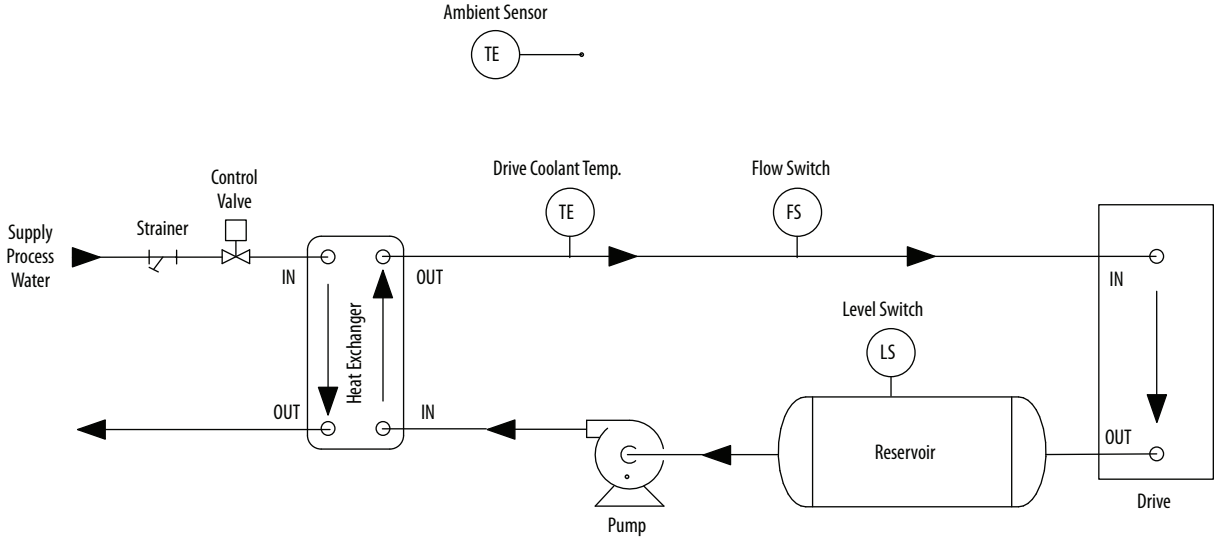
This section provides information about the various types of cooling loops.

Liquid-to-Liquid Heat Exchanger

The liquid-to-liquid heat exchanger uses a heat transfer plate to transfer heat from one liquid to another. This method requires a stable water supply from the user.



The drawing below shows a cooling loop diagram for a typical liquid-to-liquid heat exchanger.

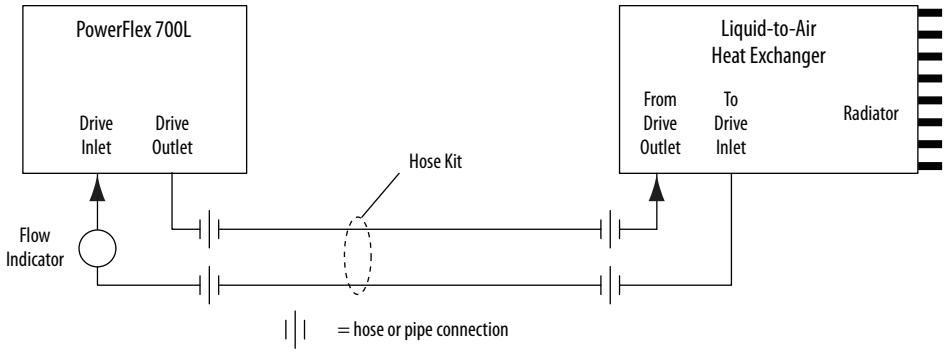


The main components of the liquid-to-liquid heat exchanger cooling loop are listed below.

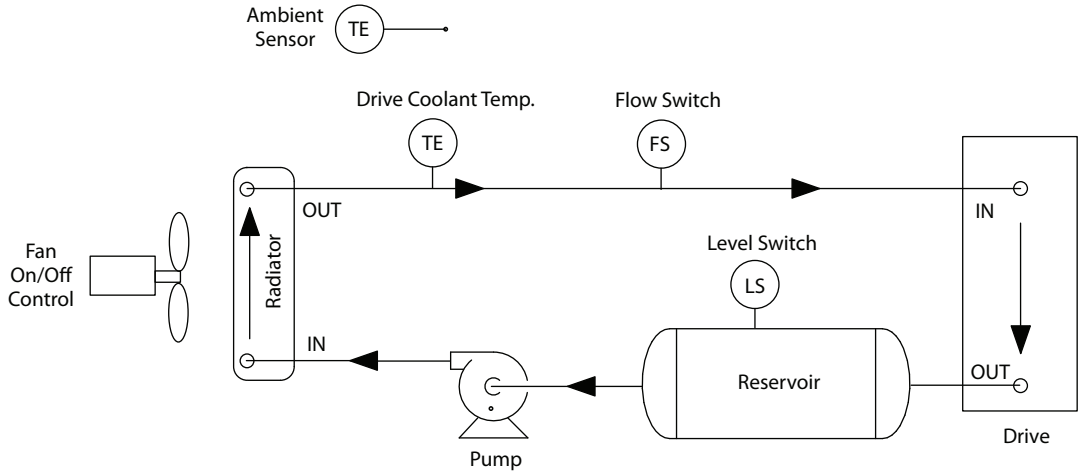
Part	Description
Strainer	Filters particles from the supply water.
Control Valve	Controls the supply loop water flow.
Heat Exchanger Plate	Transfers heat from the drive loop to the supply loop.
Ambient Sensor	Senses the ambient temperature used for the dew point control.
Drive Coolant Temperature Sensor	Senses the drive coolant temperature used for the dew point control.
Drive Coolant Flow Switch	Measures the drive coolant flow rate.
Level Switch	Senses the level of coolant in the reservoir.
Reservoir	Stores drive coolant.
Pump and Motor	Circulates drive coolant.

Liquid-to-Air Heat Exchanger

The liquid-to-air heat exchanger uses radiator technology to transfer heat from a liquid to surrounding air. This is a simple closed loop system — it does not require a water supply from the user. However, this system requires surrounding air 5...10 °C below the maximum operating temperature of the drive.



The drawing below shows a cooling loop diagram for a typical liquid-to-air heat exchanger.

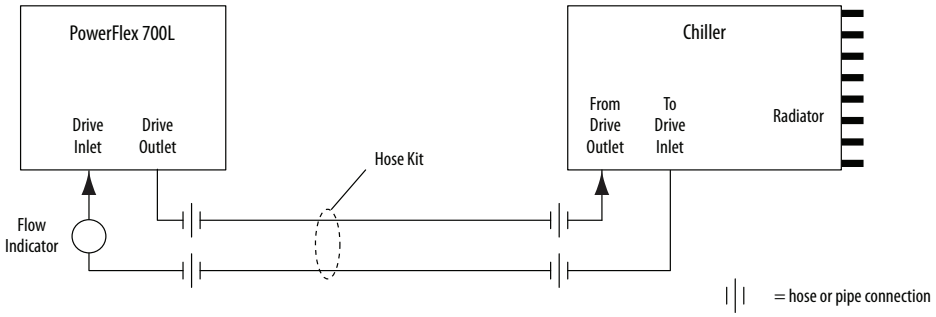


The main components of the liquid-to-air heat exchanger cooling loop are listed below.

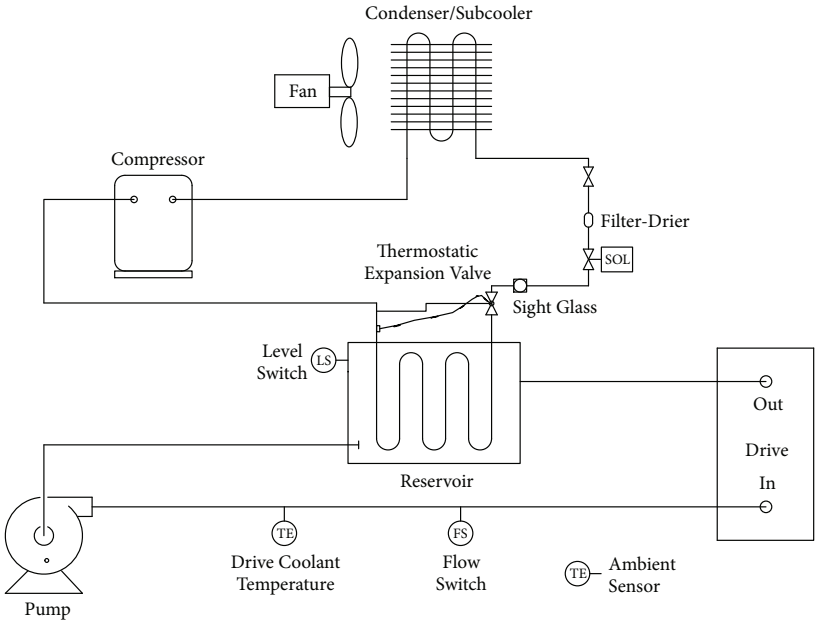
Part	Description
Fan	Blows air across the radiator.
Radiator	Transfers heat from liquid to air.
Ambient Sensor	Senses the ambient temperature used for the dew point control.
Drive Coolant Temperature Sensor	Senses the drive coolant temperature used for the dew point control.
Drive Coolant Flow Switch	Measures the drive coolant flow rate.
Level Switch	Senses the level of coolant in the reservoir.
Reservoir	Allows for expansion of coolant.
Pump and Motor	Circulates drive coolant.

Chiller

The chiller uses refrigerant to transfer heat from a liquid to air. This is a simple closed loop system — it does not require a water supply from the user. A chiller can achieve almost any coolant temperature required. Coolant temperature should be at or above ambient temperature to avoid condensation on drive components.



The drawing below shows a cooling loop diagram for a typical chiller.



The main components of the chiller cooling loop are listed below.

Part	Description
Compressor	Forces the refrigerant into a smaller space.
Fan	Blows air across the condenser/subcooler.
Condenser/Subcooler	Cools the refrigerant.
Filter-Drier	Filters the refrigerant.
Sight Glass	Allows viewing of the level of drive coolant in the reservoir.
Thermostatic Expansion Valve	Allows for expansion of the refrigerant.
Level Switch	Senses the level of coolant in the reservoir.
Reservoir	Allows for expansion of coolant.
Pump and Motor	Circulates drive coolant.

Part	Description
Drive Coolant Temperature Sensor	Senses the drive coolant temperature used for the dew point control.
Drive Coolant Flow Switch	Measures the drive coolant flow rate.
Ambient Sensor	Senses the ambient temperature used for the dew point control.

Cooling Loop Resources

Cooling loops are available from many suppliers, such as Dimplex Thermal Solutions, which can be contacted as follows:

USA and Canada:1-800-968-5665

Elsewhere:1-269-349-6800

Cooling Loop Application Guidelines

Do not use ferrous and plated-ferrous materials for pipe-treated water to the power modules and drive. Use of ferrous materials will degrade the performance of the power module chillplate.

Use the following guidelines for applying cooling loops.

- The allowable drive coolant temperature range is listed below:
  - Frame 2 Drive:0...50 °C (32...122 °F)
  - Frame 3A/3B Drive:0...40 °C (32...105 °F)

  When using coolant at a temperature below the dew point of the surrounding air, condensation can accumulate on the drive heatsink and/or circuit boards, which can damage the drive. In this situation, install a coolant flow regulating device and tube/hose insulation. A flow regulating device modulates the coolant flow rate to a level that permits the drive heatsink temperature to rise above the dew point. Insulation for customer side tube or hose can be closed-cell foam insulation with a minimum 12.7 mm (0.50 in.) wall thickness.
- Include a flow switch in the cooling loop on the connection to the drive inlet to turn off the drive if coolant flow drops below the minimum flow required by the drive (see table on page 46).
- Circulate coolant through the drive only when the drive is also powered. Failure to do this can result in condensation accumulating on the drive heatsink and/or circuit boards, which could damage the drive.
- Use an interlock from the cooling loop to stop the drive when the cooling loop is faulted.
- For applications requiring a closed loop coolant system, vent the system to remove air that can otherwise degrade the performance of the drive heatsink.
- Install a flow measuring device at the inlet of each converter and each inverter power module. Note that flow measuring devices are included in the PowerFlex 700L frame 3A and 3B complete drive cabinets (13th position in catalog number = A). The coolant flow rate (GPM) must meet the requirements in the table on page 46.
- We recommend the following types of pipe for cooling loop connections:
  - Copper tubing, type L
  - Brass pipe
  - Stainless steel, 300 series

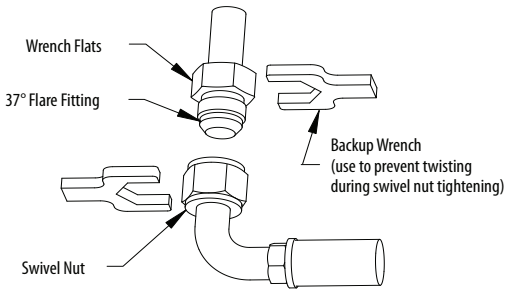
  Do not use galvanized pipe.
- Provide a method in the cooling loop for draining and replacing the coolant.

Drive Coolant Connections

Frame 2 Drive or Frame 3A or 3B Power Module

Coolant connections for frame 2 drives and frame 3A and 3B power modules are made using 37 degree flare fittings which have a:

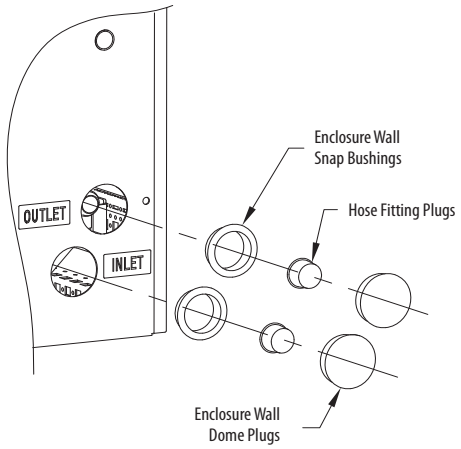
- 3/4-inch nominal size
- '-12' SAE dash size
- 1-1/16-12 UN/UNF-2B external thread size

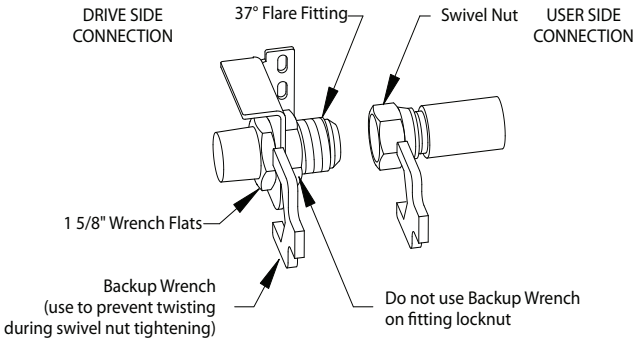


Frame 3A/3B Complete Drive

Frame 3A/3B Complete Drive coolant connections are made using 37 degree flare fittings which have a:

- 1-inch nominal size
- '-16' SAE dash size
- 1-5/16-12 UN/UNF-2B external thread size





Drive Cooling Loop Hose Kits

Depending on the location of the heat exchanger or chiller relative to the drive, the following drive cooling loop hose kits are available.

Hose Length	Hoses in Kit	Drive Side (1) Coupling Size	Heat Exchanger Side Coupling Size	Used With	Hose Kit (2) Catalog Number
3 m (10 ft)	2	0.75 inch	0.75 inch	Frame 2	20L-GH10-B1
9.1 m (30 ft)	2	0.75 inch	0.75 inch	Frame 2	20L-GH30-B1
3 m (10 ft)	2	1 inch	1 inch with 90° elbow	Frame 3A	20L-GH10-A2
9.1 m (30 ft)	2	1 inch	1 inch with 90° elbow	Frame 3A	20L-GH30-A2
3 m (10 ft)	2	1 inch	1 inch	Frame 3B	20L-GH10-A1
9.1 m (30 ft)	2	1 inch	1 inch	Frame 3B	20L-GH30-A1

(1) All drive side hose kit fittings are 37 degree flare.

(2) Each hose kit contains two (2) hoses and the appropriate connectors.

Drive Coolant Requirements

Recommended Coolants

The table below lists approved sources and recommended coolants with appropriate corrosion inhibitors for the drive loop.

Source	Coolant
Interstate Chemical http://www.interstatechemical.com/contact.htm	• NFP-50 (1); a 50/50 premix of propylene glycol and distilled water • NFE-50 (1); a 50/50 premix of ethylene glycol and distilled water
Koolant Koolers/Dimplex Thermal Solutions http://www.koolantkoolers.com/index.php/nic=contact	• K-Kool-E (1); ethylene glycol (available premixed with distilled water) • Propylene glycol (1) also available
Dow Chemical http://www.dow.com	• Dowtherm® SR-1 (2); ethylene glycol • Dowfrost® (2); propylene glycol Dowtherm and Dowfrost are registered trademarks of the Dow Chemical Company

(1) Available in 5 gallon pails.
(2) Not premixed with distilled water, and may not be available in 5 gallon quantities.

Non-premixed coolants require a coolant-to-water mix ratio of 50% by volume.

IMPORTANT Since coolant performance slowly degrades over time, we recommend replacing the drive loop coolant every two years and/or whenever the loop is drained for servicing.

Corrosion Inhibitor

If an approved coolant is not used, the drive coolant must consist of clean water **with a corrosion inhibitor**. An approved corrosion inhibitor is Chemtool, Inc. (www.chemtool.com) part number Watertool 4435-C. The recommended concentration of the inhibitor is 8-10% by volume. **Deionized water is prohibited**. Use distilled water or water with less than 50 ppm concentrations of these chemical compounds:

- Sulfate and chloride
- Hard water ions such as Mg++ and Ca++

Ethylene and propylene glycols must be inhibited and silicate free. **Use of common silicate-containing, automotive-type ethylene glycol solutions is prohibited as they can damage the heat exchanger and/or drive and cooling module equipment.**

The drive coolant must be compatible with the following materials:

- Copper
- Brass
- Aluminum
- Arimid fiber gasket with nitrile binder (Garlock, Inc. Blue-Gard 3000®)

Blue-Gard 3000 is a registered trademark of Garlock, Inc.

- Synthetic rubber hose (Parker Hannifan Corp 801 General Purpose Hose)
- Viton seal (only Complete Drive)

Biocide

A biocide may be needed to control biological growth. Use of a biocide is permitted. For specific recommendations, consult a reputable water treatment company.

Coolant Requirements for One Frame 2, 3A or 3B Drive

Drive Frame Size	Coolant Temperature Range	Minimum Coolant Flow Rate	Pressure Drop (2) From Drive Inlet to Drive Outlet at Minimum Coolant Flow Rate	Coolant Type
2	0…50 °C (32…122 °F)	30.3 LPM (8 gpm)	1.58 bar (23 psi)	WEG50 (3) or WPG50 (4)
3A	0…40 °C (32…104 °F)	30.3 LPM (8 gpm)	0.35 bar (5 psi)	
3B	0…40 °C (32…104 °F)	56.8 LPM (15 gpm) (1)	0.48 bar (7 psi) (1)	

(1) Frame 3B includes separate converter and inverter power modules. A single inverter or converter power module requires a minimum flow rate of 30.3 LPM (8 gpm) at 0.35 bar (5 psi).
(2) Pressure drop does not include any system connections such as hoses or piping. Cooling systems must be sized to provide minimum flow considering entire system pressure drop.
(3) WEG50 equals good quality or distilled water with approved **inhibited*** ethylene glycol, 50% glycol by volume.
(4) WPG50 equals good quality or distilled water with approved **inhibited*** propylene glycol, 50% glycol by volume.

* Inhibited ethylene glycol or propylene glycol must contain a corrosion inhibitor. See Corrosion Inhibitor on page 45 for an approved source.

Estimated Coolant Amount for the Drive Loop

Drive Frame Size	Estimated Amount of Coolant (1)
2	15.1 liters (4 gal)
3A	19 liters (5 gal)
3B	19 liters (5 gal)

(1) The estimated amount of coolant is based on the heat exchanger using 1.2 m (4 ft) hoses. Longer hoses require more coolant. The maximum hose length of 9.1 m (30 ft) would require up to an additional 2.8 liters (0.75 gal).

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
PowerFlex 700L Liquid-Cooled Adjustable Frequency AC Drive User Manual, publication 20L-UM001	This manual provides the basic information needed to install, start-up, and troubleshoot the PowerFlex 700L Liquid-Cooled AC drive.
PowerFlex 700L Active Converter Power Module User Manual, publication PFLEX-UM002	The purpose of this manual is to provide you with the basic information needed to wire and operate the PowerFlex 700 Active Converter Power Module.
PowerFlex 700 AC Drives - Frames 0…10 User Manual, Vector Control Firmware 4.001 and Up, publication 20B-UM002	The purpose of this manual is to provide you with the basic information needed to program and troubleshoot the PowerFlex 700 Adjustable Frequency AC Drive with Vector Control.
PowerFlex 700S High Performance AC Drive - Phase II Control Programming Manual, publication 20D-PM001	The purpose of this manual is to provide you with the information needed to start-up, program and troubleshoot PowerFlex 700S Phase II Adjustable Frequency AC drives.
PowerFlex 70/700 Adjustable Frequency AC Drives Reference Manual, publication PFLEX-RM001	The purpose of this manual is to provide detailed drive information including operation, parameter descriptions and programming.
PowerFlex 700L Liquid-to-Liquid Heat Exchanger User Manual, publication 20L-UM002	The purpose of this manual is to provide you with the installation and operating information for the PowerFlex 700L Liquid-to-Liquid Heat Exchanger used with PowerFlex 700L Liquid-Cooled drives and power modules.
Industry Installation Guidelines for Pulse Width Modulated (PWM) AC Drives, Application Technique, publication DRIVES-AT003	The purpose of this application technique is to provide basic information for different enclosure systems and environmental/location considerations (to help protect against environmental contaminants), and power and grounding considerations needed to properly install a Pulse Width Modulated (PWM) AC drive.
Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives, publication DRIVES-IN001	This manual provides the basic information needed to properly install, protect, wire, and ground pulse width modulated (PWM) AC drives.
Preventive Maintenance of Industrial Control and Drive System Equipment, publication DRIVES-TD001	Provides a checklist that can be used as a guide for performing preventive maintenance of industrial control and drive system equipment.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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